Ontario

Advisory Council on Occupational Health and Occupational Safety

Sixth Annual Report
April 1, 1983
to March 31, 1984

84- 3998 /

Mandate and Objectives

The function of the Advisory Council is and it has power to*:

a) make recommendations to the Minister of Labour relating to programs of the ministry in occupational health and occupational safety; and
b) advise the minister on matters relating to occupational health and occupational safety which may be brought to its attention or be referred to it.

To achieve this Council has set the following objectives:

Primary Objective
To advise the Minister of Labour on all matters relative to occupational health and safety in Ontario.

Secondary Objectives
1. To ensure as far as possible that the policies and programs in occupational health and safety effectively minimize the risks to health and safety in all workplaces in Ontario.
2. To ensure as far as possible that knowledge about occupational health and safety is available to management, labour and the public and that it is understood by them.
3. To assist in promoting and establishing mechanisms involving management and labour to solve problems in occupational health and safety.
4. To ensure as far as possible that there is appropriate manpower training and development for the occupational health and safety field.
5. To review periodically the effectiveness of the policies and programs implemented to achieve objectives 1 to 4. **

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*The Occupational Health and Safety Act.s 10(7).
**added June, 1980.

Advisory Council on Occupational Health and Occupational Safety

Sixth Annual Report
April 1, 1983
to March 31, 1984

**400 University Ave.,
15th Floor,
Toronto, Ontario
M7A 1T7**

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Ontario

Advisory Council on
Occupational Health &
Occupational Safety

Office
of the
Chairman

400 University Avenue
Toronto, Ontario
M7A 1T7
416/965-2448

May 1984

The Honourable R. H. Ramsay
Minister of Labour
400 University Avenue, 14th Floor
TORONTO, Ontario
M7A 1T7

Dear Mr. Minister:

I have the honour to submit the Sixth Annual Report of the Advisory Council on Occupational Health and Occupational Safety for the fiscal year 1983-84.

Respectfully,

DR McCalla

D. R. McCalla
Chairman

Encl.

Advisory Council on Occupational Health and Occupational Safety Members and Officers 1983-84

W. A. Barnes (1983)
General Motors of Canada
St. Catharines

R. T. Boldt (1985)
Dow Chemical Canada, Inc.
Sarnia

N. Caldbick (1986)
Housewife
Timmins

J. W. Charters (1985)
Steel Company of Canada
Hamilton

W. Curlook* (1986)
Inco Ltd.
Toronto

D. Dewees (1984)
University of Toronto
Toronto

J. Duffy (1985)
Provincial Bldg. & Const. Trades Council
Don Mills

P. A. Fisher (1985)
Fisher Farms
Burlington

J. Gill (1985)
United Automobile Workers
Willowdale

L. Heard (1986)
United Steelworkers of America
Toronto

E. Kaegi (1984)
C-I-L
Willowdale

M. D. S. Kellow** (1983)
Abitibi-Price Inc.
(retired)
Toronto

D.R. McCalla (1987)
(Designated Chairman February 1984)
McMaster University
Hamilton

T. H. Meagher* (1986)
Ontario Federation of Labour
Don Mills

J.M. More (1984)
Energy & Chemical Workers Union
Oakville

W.K.C. Morgan* (1986)
University of Western Ontario
London

H.D. Moyer* (1986)
General Motors of Canada
Oshawa

J.F. Mustard*** (1984)
(Chairman to January 31, 1984)
Canadian Institute for Advanced Research
Toronto

T. O'Connor* (1986)
Canadian Union of Public Employees
Don Mills

C.G. Pilkey (1983)
Ontario Federation of Labour
Don Mills

P.L. Rooney**** (1986)
The Algoma Steel Corp.
(retired)
Sault Ste. Marie

G.J. Stopps (1983)
University of Toronto
Toronto

M. A. Taschereau (1983)
Mining Consultant
Toronto

C. J. Tuohy (1985)
(Designated Vice-Chairman June 1983)
University of Toronto
Toronto

E. A. Waddell (1985)
Ontario Federation of Labour
Don Mills

V. Biggar
Executive Assistant
(Acting, from July 1983)

A. J. Byrne
Executive Secretary
(Died January 25, 1984)

K. M. Caverhill
Research Officer
(from November 1983)

P. L. Chan
Research Officer
(from September 1983)

I. S. Glasberg
Research Officer
(to July 1983)

E. Harney
Executive Assistant
(on educational leave from July 1983)

A.J. Koven
Project Officer
(from December 1983)

G. Perry
Research Officer

Q. Pollock
Research Officer
(from July 1983 to October 1983)

N. R. Subramanian
Committee Officer

Members' terms expire(d) on October 31 of the year indicated in parentheses.

* *Appointed November 30, 1983.*
** *Died October 18, 1983.*
*** *Dr. Mustard resigned from council January 31, 1984.*
**** *Appointed January 5, 1984.*

Preface

The Advisory Council on Occupational Health and Occupational Safety has now completed its sixth full year. In many respects this has been a landmark year for council. Many activities and directions in which council is presently proceeding can be seen as natural extensions of much of its earlier work. The year has also seen the departure of a significant number of council's long-standing participants.

The introductory section of this year's annual report reflects briefly on past introductory themes and council's past activities, and, against this backdrop, outlines some of the directions for council's future work.

The annual report's next main section presents council's advisory memoranda submitted to the minister during the year. The publishing, on an annual basis, of council's advice to the minister along with the minister's formal responses has always been considered an important practice of council. Accordingly,the Sixth Annual Report records the minister's responses received during the year and follow-up correspondence from previous advisory memoranda as well as other correspondence that provides further background to council's activities and possible future work.

Council continued its current role in reviewing the procedures involved in the development of designated substances regulations. Advisory Memoranda 83-I and 83-II set out details of council's review of the process used in the development of regulations for isocyanates and silica respectively. Council's observations and involvement in these and past reviews gave rise to significant deliberation by council as to the efficacy of the process and of its own role in it. Consideration of these matters can be expected to intensify in the coming year.

Advisory Memorandum 83-III comprises the first segment of council's advice on health surveillance and health screening in occupational health programs. The fourth advisory memorandum submitted during the year dealt with the identification and control of carcinogens and potential carcinogens. This first phase of council's advice on this subject addressed the area of new chemical and biological agents. The principles described in the memorandum will serve as a basis in the development of council's advice with respect to 'old' carcinogens already in the workplace.

Council received a request from the minister for clarification of the previous advisory memorandum on the electromagnetic spectrum and potential reproductive hazards of visual display units, which appeared in the Fifth Annual Report. Council's clarification and the minister's response are included in the Sixth Annual Report. In council's last two annual reports council has, for its introductory theme, focused on technological change and its potential impact on occupational health and safety. In the coming year, council will be considering this topic in more detail, and, in this context, visual display units serve as an example of new technology now in widespread use.

Other correspondence with the minister, likewise recorded in the annual report, relate to the previous advisory memorandum on legal interpretation of the *Occupational Health and Safety Act*, the study being undertaken by council of joint health and safety committees in Ontario workplaces, and matters concerning priorities for action in the control of toxic substances.

Having now concluded its deliberations on recommendations set out in papers on literacy and occupational health and safety and on reproductive hazards, council will be submitting its advice in these areas to the minister early in its next fiscal year.

The final section of this year's annual report contains administrative matters. The advisory council is governed by section 10 of the *Occupational Health and Safety Act*, which has been reproduced in full for easy reference. The council's objectives and terms of reference are also set out in this section, as well as dates of council meetings and the terms of reference, membership, and meeting dates of its task forces.

An appendix at the end of the report contains a variety of statistics, including the number and frequency rate of compensated occupational fatalities, major disabilities, injuries and illnesses, and days lost for compensated temporary total disability. Council wishes to thank the Canadian Centre for Occupational Health and Safety for providing these statistics.

Council is indebted to the invaluable assistance of the non-council members of council's task forces, who have been appointed to contribute their expertise to particular committees. Council also expresses its gratitude for the support and co-operation it has received from members of management and labour and from private and public associations and agencies.

A significant number of changes have occurred in council's membership during the past year. Council was sorry to lose four of its members on the expiry of their terms. Council gratefully acknowledges the years of commitment and contribution of Mr. Al Barnes, Mr. Cliff Pilkey, Dr. Jim Stopps, and Mr. Malcolm Taschereau. Another member died during his term on council. Council very much regrets the passing of Mr. Mark Kellow and is grateful for his contribution to council's work.

Dr. Fraser Mustard resigned at the end of January 1984 as chairman of council. His invaluable contribution to the nature and thrust of council's activities is much appreciated by all who have worked with him. Council thanks him for the wisdom, energy and insight he has injected since council's beginnings and wishes him much success in his other and new endeavours.

Council is pleased to announce the appointment of Dr. Dennis McCalla as its new chairman and looks forward to working with him over the coming years. Council is also pleased to announce the designation of Dr. Carolyn Tuohy as vice-chairman.

Five new members joined council in 1983/84. Council welcomes the appointments of Dr. Walter Curlook, Dr. Keith Morgan, Mr. Harvey Moyer, Mr. Terry O'Connor and Mr. Pat Rooney.

Mr. Irwin Glasberg, a member of council's staff, has moved to a new position within the ministry. His valued contribution to council's work was greatly appreciated.

Council and council staff deeply regret the untimely passing of Mr. Abbey Byrne, who served as executive secretary until his death in January 1984. His contribution to council and the interests of occupational health and safety, which held particular significance for him, will be long remembered.

INTRODUCTION

Recent Themes and Current Undertakings

In past annual reports the introductory section has been used as a 'forum for council to share with government, management, labour and the public at large some general observations on selected matters of significance for the future of occupational health and safety in Ontario.'[1] This year's introduction briefly describes a number of initiatives, which council is undertaking presently, against a background of some of its past activities and introductory themes.

Information and Participation as Influences on a Population's Health Status

Council's earlier annual reports discussed how the major improvements in a population's health status can be achieved through changing the influences of the environment and people's lifestyles and the importance of information as a key component to the understanding of these influences. Council described the dissemination of information as an integral part of a co-operative problem-solving approach in labour-management relations. The extent of information sharing among workers, management and government was seen to reflect the degree of commitment by all parties to the principle of worker participation in health and safety programs.

In recent years council has undertaken to seek the opinions of representatives from management and labour as one means of identifying specific problems and of assessing how well management and labour were supporting and developing the concept of participation through the joint committee structure set forth in the *Occupational Health and Safety Act*. To this end council held open meetings with representatives from management and labour in Thunder Bay and Kitchener. It was apparent from these meetings that workers are involved in occupational health and safety programs to a greater extent than they were previously and that there was a genuine determination on the part of many from both labour and management to find solutions to health and safety problems. However, these trips also revealed that, for many involved, a satisfactory level of participation had not been achieved and that the working and the effectiveness of the joint health and safety committees varied considerably from plant to plant.

Council recognized that this approach to gathering information was limited in many respects; for example, council was not able in those instances to meet with representatives from small business.

Joint workplace committees have a prominent role in the implementation of the Act and of the designated substance regulations. Given this role, it is important to gain a more comprehensive assessment of the functioning of joint health and safety committees across the province and to identify:

- where and to what extent committees are succeeding and/or are falling short in the fulfilment of the internal responsibility goals;
- means by which the effectiveness of the committees can be enhanced, and
- problem areas warranting special and concentrated attention.

To overcome some of the limitations inherent in its earlier approaches, council is presently undertaking an extensive survey of joint committees. It should be pointed out that, at the time council was initiating plans to conduct a systematic study of joint committees, the Ministry of Labour also felt the need for an assessment of the functioning of committees and was planning to have a survey undertaken. It was subsequently agreed that one study should be conducted under the auspices of council.

The design of the survey is intended to permit industry-by-industry comparisons of unionized and non-unionized workplaces of various sizes. Committee's access to, and use of, information will be explored. It is hoped that insight will be gained into the effect of literacy levels and language differences on the dissemination of information and the participation on committees, and whether, on the other hand, joint committees may be effective vehicles for overcoming potential and existing communication barriers.

Through rights and responsibilities laid out in regulations for designated substances, joint health and safety committees are intended to provide an important element in the control of exposure to hazardous substances in workplaces. The survey will attempt to assess the committee's consultative process with respect to designated substance regulations and related codes.

Technological Development

The introductory sections of council's last two annual reports considered the potential impact of technological development on occupational health and safety. It was suggested that, with proper incentives, new knowledge and technology will be increasingly applied as a means of controlling exposure to hazardous substances, reducing risks to workers and improving the quality of working life. Council pointed to various applications of technological developments that free workers from dangerous tasks. At the same time, it was stressed that technological developments bring with them their own set of health and safety problems. A considerable array of concerns accompanied the introduction of visual display units into workplaces. Council has reviewed the radiation spectrum and the possible reproductive hazards associated with visual display units. In future, council will be considering occupational health and safety implications of new technology and arrangements for the introduction of new technology.

Control of Hazardous Substances and Agents

A substantial proportion of council's attention and resources have been taken up by matters pertaining directly and indirectly to various aspects of the control of hazardous substances in the workplace, and, in particular, by its role in reviewing the process used in the development of designated substance regulations. A number of the topics addressed by council are highlighted here.

In its first annual report, council made recommendations on federal-provincial co-ordination of roles on occupational health and safety matters with specific reference to the nuclear fuel cycle.

In an advisory memorandum appearing in its second annual report, council considered the administration of aluminum inhalation therapy in the Ontario mining industry and made recommendations on policy and principles for using prophylactic agents in the workplace.

Council has, in the past, considered the policy options available to prevent harmful health effects from new chemical hazards in the workplace.[2] This year's annual report includes council's Advisory Memorandum 83-IV on the identification and control of carcinogens and potential carcinogens. That memorandum represents the first phase of council's advice on carcinogen policy and addresses the area of new chemical and biological agents. With the groundwork laid out in Advisory Memorandum 83-IV as a basis, council will next consider the issue of identifying and regulating carcinogenic substances that are already in the workplace. In so doing, council will be taking into account current events, as well as the briefs submitted in response to the discussion paper that was published in council's fifth annual report.

Another aspect of hazardous substances considered by council has been in the context of women and occupational health and safety, and, more specifically, of reproductive hazards in the workplace. In its consideration of this issue, it was clear that male and female workers of reproductive capacity, their offspring and society as a whole are totally affected by the ways in which the associated problems and issues are treated. Council's advice on the subject of reproductive hazards is expected to be submitted to the minister early in this next fiscal year.

Up to the end of the year covered by this annual report, council has undertaken a review of the process used in the development of eight draft designated substance regulations. During the course of carrying out these reviews, the efficacy of the designation process and of council's role in it has been the subject of considerable debate. Concerns have been expressed that council's involvement, although limited to a review of the process leading to the development of ministry standards, generates misconceptions about this involvement and gives rise to perceptions that the regulations themselves and the exposure limits set out in them have, in some manner, had the endorsement of council. This problem remains, and the issue can be expected to be a matter for further consideration.

In addition to various aspects of the designation process that council has commented on in its advisory memoranda reviewing the process for the development of individual regulations, council has submitted advice to the minister on the interpretation of epidemiological studies and on a format for their presentation in the background material accompanying proposed designated substance regulations.[3] The information available to involved parties on which to base decisions about priorities for the control of hazardous substances, and about the appropriateness of regulation and of control measures, is a key ingredient affecting the quality of policies and procedures that are formulated. Council intends to consider further means for the systematic development of information for these purposes.

Whatever else may be said with respect to the designated substance regulation approach to control of hazardous substances, the inherent slowness of a substance-by-substance process of designation for a complex set of regulations clearly calls for interim solutions, alternatives or supplementary control measures to ensure more comprehensive protection. It is essential that attention be turned to options for control, the nature of participation of affected parties in the development of control measures and the role of joint health and safety committees in the achievement of effective levels of protection.

Footnotes

1. Advisory Council on Occupational Health and Occupational Safety, Interim Statement, November 1977 to March 31, 1978, p.5.
2. See Advisory Council on Occupational Health and Occupational Safety, First Annual Report, pp.53-70.
3. Advisory Council on Occupational Health and Occupational Safety Fifth Annual Report, pp.134-190.

COUNCIL'S ADVISORY MEMORANDA

Ontario

Office of the
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Ministry
of
Labour

400 University Avenue
Toronto, Ontario
M7A 1T7
(416) 965-4101

November 12, 1982

J. Fraser Mustard, M.D.,
Chairman Advisory Council on
Occupational Health and
Occupational Safety,
15th Floor,
900 University Avenue,
Toronto, Ontario.

Dear Dr. Mustard:

I have enclosed a copy of the proposed isocyanates regulation and background material for the review and comment of the Advisory Council. I look forward to receiving the Council's advice at its earliest convenience.

Yours sincerely,

R. H. Ramsay,
Minister.

Encl.

Ontario

Advisory Council on
Occupational Health &
Occupational Safety

Office
of the
Chairman

400 University Avenue
Toronto, Ontario
M7A 1T7

416/965-2448

May 31, 1983

The Honourable R. H. Ramsay
Minister of Labour
400 University Avenue
14th Floor
Toronto, Ontario
M7A 1T7

Dear Mr. Minister:

On behalf of the advisory council, I am enclosing Advisory Memorandum 83-I in which council has reviewed the process for development of the isocyanates regulation, in light of the policies and principles set out in Advisory Memorandum 78-II.

Council hopes that you will find the suggestions contained in this document to be useful.

Yours truly,

J. F. Mustard, M.D.
Chairman

Encl.

cc to: T. E. Armstrong, Q.C.
Dr. A. E. Robinson
Mr. B. Goodman

Advisory Memorandum 83-I
to the Minister of Labour
May 17, 1983

A Review by the Advisory Council of the Process Used to Develop a Standard for Isocyanates and Council's Evaluation of the Criteria Utilized to Assess the Hazard of Exposure to Isocyanates in the Workplace

INTRODUCTION

In February 1978, the advisory council and the then Minister of Labour agreed that council should be given the task of reviewing the principles and procedures used in setting occupational health standards and guidelines in Ontario. In Advisory Memorandum 78-II, council set out a list of the basic principles and procedures that should ideally characterize the policy process in respect to establishing standards, guidelines and codes. In this document, council undertook to review the criteria utilized by the Ministry of Labour to evaluate occupational health hazards and to follow the ministry's standard setting process through to its final form. It was also clearly understood that council would limit its review to the process leading to the development of ministry standards. In its memorandum, council also stated that it would require 30 days to complete its review function. In subsequent correspondence with the minister, it was agreed that, because of public interest in the area, council's review of the standard setting process should be submitted in the form of an advisory memorandum.

In June 1980, the Ministry of Labour published a Notice of Intent to designate isocyanates as agents 'to which the exposure of a worker is prohibited, regulated, restricted, limited or controlled under the *Occupational Health and Safety Act*.' This was followed, in August 1980, by a notice setting forth the ministry's proposed regulation for isocyanates. The notice invited public comments and stipulated that such comments would be made available for public examination. At the same time, the ministry distributed copies of the proposed regulation and two accompanying codes to interested members of the public. In October 1980, the ministry distributed a document entitled *Interim Report on the Designation of Isocyanates in Ontario*. This document dealt with such topics as the use of isocyanates in Ontario, workplace exposures to isocyanates and the health effects that could arise as a result of such exposures. Each interim report also contained a copy of the proposed regulation and the two attached codes. On July 8, 1981, the ministry held a public meeting to discuss changes that had been made to the August 1980 version of the regulation. A revised version of the proposed regulation and the two codes were distributed at this time, along with an entirely new Code for Medical Surveillance of Isocyanates Exposed Workers. Invitees were informed that they would have a short period of time to comment on any revisions that had been made to the regulation and codes.

On November 12, 1982, the ministry submitted to the advisory council a revised version of the isocyanates regulation. Several weeks thereafter, council received from the ministry a document entitled *The Report on the Designation of Isocyanates in Ontario*. This document contained, among other things, a summary of the views expressed by members of the public on the various provisions contained in the first and second drafts of the regulation. The type of action taken by the ministry in response to the submissions made was also outlined. The background materials supplied to council did not contain an analysis of the type of economic impact that Ontario industry would likely experience if the provisions contained in the proposed isocyanates regulation were implemented.

After an initial review of the revised regulation and accompanying background materials, council asked that a meeting be scheduled between its Task Force on Regulations and ministry officials. The objective of this meeting was to permit task force members to explore, in greater depth, the rationale employed by the ministry to arrive at certain policy decisions. The meeting in question took place on January 28, 1983. The agenda for discussion, which was prepared for this meeting, is reproduced as Appendix 1 to this advisory memorandum.

Following an examination of the minutes that were taken of the January 28 discussions, the task force asked the ministry to clarify a number of points relating to the health effects studies that were employed to establish the exposure limits contained in the proposed regulation. The letter, in which this request was made, is attached as Appendix 2. On March 22, 1983, the ministry replied in writing to the points raised in the task force's letter. This response is reproduced in Appendix 3 of the advisory memorandum.

As was the case in council's review of the process leading to the development of other designated substances regulations, council intends to focus on three aspects of the standard setting process. These are the consultative process (i.e. whether the public was provided with sufficient opportunity to comment upon, and participate in, the development of the regulation), the analytical process (i.e. whether the ministry assembled, reviewed and analysed the available evidence in a reasonable fashion, and whether the conclusions reached were compatible with the evidence) and the legal-technical process (i.e. whether the regulation and codes are internally consistent, and whether the intent of the ministry has been translated into clear and unambiguous regulatory provisions).

COUNCIL'S REVIEW OF THE STANDARD SETTING PROCESS FOR ISOCYANATES

1. The Consultative Process

To reiterate the comments made in previous advisory memoranda, council wishes to commend the ministry on the steps it has taken to make possible public participation in the standard setting process. Council strongly endorses the ministry's efforts to develop an open process for the setting of standards. Council is also cognizant of the special circumstances that surrounded the publication of the first seven designated substances regulations and the difficulty of adhering strictly to the procedures set out by council in Advisory Memorandum 78-II. In this regard, council notes that the former Minister of Labour undertook, in his reply to Advisory Memorandum 81-I on lead, to give serious consideration to a number of suggestions made by council to enhance the quality of the consultative process.

2. The Analytical Process

In reviewing the analytical process used to develop a standard for isocyanates, council's role is to judge how effectively the ministry has assembled, reviewed and analysed the available evidence. In embarking on this task, council has the advantage of examining a complex and difficult process in its final stage. Hence, council is in a position to review not only the arguments put forward by participants, but also the rationale supplied by the ministry for formulating its regulation in a particular fashion in light of the evidence and arguments raised.

As a first step in discharging its responsibilities, members of council's Task Force on Regulations met with ministry officials to seek more complete information on the rationale employed by the ministry to arrive at several important regulatory decisions. The key analytical issues taken up with ministry staff are discussed below.

a) *The Rationale for the Choice of the Exposure Limits Contained in the Proposed Isocyanates Regulation*

During the January 28 meeting, task force members asked the ministry to explain more fully its rationale for the choice of the exposure limits contained in the proposed regulation. These limits, which apply to TDI, MDI, HDI and IPDI (hereinafter referred to as the monomeric isocyanates[1]) are i) a Time-Weighted Average Exposure Limit (TWAEL) of 0.005 parts isocyanate per million parts air (ppm) and ii) a Maximum Exposure Limit (MEL) of 0.02 ppm. In responding to this question, ministry officials indicated that exposure to this class of compounds may produce a variety of adverse health effects. These include i) irritation of the eyes, skin and respiratory tract, ii) abnormal loss of pulmonary function, iii) initial sensitization to isocyanates and iv) the asthmatic reactions that may occur in previously sensitized workers who are re-exposed to isocyanates. The ministry then commented on i) the extent and quality of the available epidemiological studies on each health effect and ii) the degree to which the proposed exposure limits would protect workers from the outcomes listed.

i) Irritation

Ministry officials indicated that scientists have not observed cases of isocyanates induced irritation at exposure levels below 0.03 ppm. On this basis, the ministry concluded that the proposed standard would prevent the occurrence of this health effect in all workers.

ii) The Loss of Pulmonary Function

The ministry pointed out that the choice of the 0.005 ppm TWAEL was based on the results of two groups of epidemiological studies that examined the loss of pulmonary function in workers exposed to TDI. The first set of studies, which culminated in the work by Diem and associates,[2] incorporated a longitudinal design[3] to evaluate the health of workers who were employed in a newly constructed TDI manufacturing plant. The investigation was carried out over a period of five years on a study population of 277 workers. Of these participants, 168 were employed when the plant commenced production and 109 were added subsequently. Among members of the original worker population, the loss to follow-up at the end of the study period was 30 per cent.[4] The study consisted of nine comprehensive surveys, administered at six month intervals that measured, among other things, the percentage decline in FEV_1* test results over time.[5] Exposure to TDI was measured by personal sampling techniques, and workers were placed in either a high or low cumulative exposure category. After reviewing the results of the pulmonary function testing, the authors concluded that:

> 'The present data do not identify a specific TDI exposure below which no effect upon FEV_1 annual decline will occur. However, they do suggest that the NIOSH [National Institute for Occupational Safety and Health] recommended standard of a [0.005 ppm] 8-h time-weighted average and [0.02 ppm] short-term exposure limit is reasonable.'[6]

The second set of investigations were conducted by a group of researchers led by Musk, Peters and Wegman. These studies, which examined workers in several different polyurethane manufacturing plants, employed cross-sectional designs[7] in an attempt to relate exposure to low levels of TDI to loss of lung function. The two most recent studies published in this series are the works of Wegman *et al*,[8] and Musk *et al*.[9] In the Wegman study, 111 workers employed in an automobile seat cushion plant were followed forward in time, over a period of four years, in order to assess the impact of TDI exposure on FEV_1 test results. By the end of the investigation, a full 57 per cent of the study population had been lost to follow-up. Of the 48 workers who remained, an additional 11 were excluded from the study for various reasons. The study protocol consisted of pulmonary function testing conducted at three separate points in time (in 1972, 1974 and 1976).

The authors defined chronic loss of FEV_1 for each worker as the difference between the FEV_1 test result obtained in 1972 and the result obtained in 1976. Worker exposure to TDI was measured through the use of both personal and area monitoring techniques. Study subjects were then divided into three average exposure categories, so that each group contained an approximately equal number of workers. Wegman and associates found that loss of pulmonary function increased with exposure to TDI and that the differences between the exposure groups were statistically significant. On the basis of these results, the authors concluded that:

> '. . . chronic exposure to levels of TDI greater than 0.0035 ppm results in pulmonary function loss that is greater than predicted.'[10]

In the Musk study, 259 workers employed at three locations in a plastics manufacturing plant were observed over a period of five years to measure long-term reductions in FEV_1 test results. Due to the closing of one plant site and the high labour turnover in the industry, 59 per cent of the original study population was lost to follow-up by the end of the investigation. The study consisted of lung function surveys conducted in 1971 and 1976. Worker exposure to TDI was measured through the use of personal monitoring techniques. The results of the sampling indicated that airborne isocyanate levels were very low (a mean concentration of 0.0015 ppm was recorded for the first plant site, while a mean concentration of 0.001 ppm was recorded for the second). The authors reported that there was no evidence of any abnormal decline in pulmonary function test results at the exposure levels noted. When these findings were compared with the results obtained in earlier investigations, the authors were able to conclude that:

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* The FEV_1 test measures the volume of air that can be forcefully exhaled from the lungs in the first second of exhalation.

> '. . . mean exposures of less than 0.003 ppm appear to have no acute or chronic effect on pulmonary function at least with respect to symptoms and changes in FEV_1.'[11]

In evaluating the relative merits of the two study groups, the ministry emphasized that the overall quality of the epidemiological data is poor. While ministry officials indicated that the choice of the 0.005 ppm TWAEL was based on the conclusions reached in both sets of studies, it appears, at least implicitly, that greater weight has been placed on the works of Diem and associates. In this respect, the ministry has criticized the most recent Wegman study on the basis of the method used to calculate changes in FEV_1 test results (i.e. the slope of the line defined by the scores obtained in the 1972 and 1976 tests). In the view of ministry officials, reliance on only two data points may obscure any variability or biases that may exist in test results. The ministry has also taken the position that the findings of the Wegman group of studies may have overestimated the loss of pulmonary function since the populations studied may have included some previously sensitized workers. With respect to the most recent work by Musk, the ministry's view is that, since the conclusions reached are essentially negative, this study does not provide a satisfactory basis for rejecting the proposed TWAEL. On the grounds, then, that the Diem group of studies are less subject to bias than the works of Musk, Peters and Wegman, the ministry has apparently accepted the conclusion contained in the latest Diem paper that a TWAEL of 0.005 ppm will minimize the abnormal loss of pulmonary function caused by exposure to isocyanates.

iii) Initial Sensitization to Isocyanate Compounds

Ministry officials pointed out that the available epidemiological studies have not been able to identify a single exposure limit that will protect all workers from initial sensitization. This has been the case largely because a) individual workers have different susceptibilities to isocyanates and b) sensitization may occur when a worker is exposed to an elevated level of isocyanates for only a short period of time. Ministry officials also indicated that the relationship between sensitization and the loss of pulmonary function is by no means clear. On the basis of these uncertainties, the ministry concluded that the proposed regulation should contain both a Time-Weighted Average Exposure Limit and a Maximum Exposure Limit. The decision was then made to adopt the exposure levels that had been recommended in the 1978 NIOSH criteria document on isocyanates (i.e. a TWAEL of 0.005 ppm and a MEL of 0.02 ppm).[12] At these levels, the ministry expressed confidence that the great majority of workers would not become sensitized to isocyanates.

iv) Asthmatic Reactions in Previously Sensitized Workers

The ministry indicated that, to date, scientists have not been able to define a 'no effects' level for individuals who have been previously sensitized to isocyanates. In this regard, some researchers believe that exposure to concentrations of isocyanates as low as 0.001 ppm (or lower) may be sufficient to trigger reactions in some people. Ministry officials then pointed out that the control of isocyanate exposures at these levels is probably unachievable on the basis of current technology. Furthermore, even if adequate control methods were available, it would not be possible to measure minute concentrations of the compounds in a reliable fashion and, thus, ensure compliance with the regulation. Ministry officials emphasized, however, that sensitization is not an instantaneous process. In this respect, it was noted that the Code for Medical Surveillance of Isocyanates Exposed Workers contains provisions that are designed to identify employees who are exhibiting early signs and symptoms of sensitization. The removal of such workers from isocyanate exposure environments might preclude or limit any further deterioration in health. The ministry also pointed out that sub-section 4(1) of the proposed regulation now specifies that an employer must reduce exposures to the four monomeric isocyanates to the lowest practical level. This provision should help to ensure that fewer workers who have been previously sensitized to isocyanates will suffer reactions upon subsequent exposure.

v) Council's Review of the Analytical Process

It is clear that the ministry faced a difficult task in establishing exposure limits for the four monomeric isocyanates, particularly in light of the general absence of high quality epidemiological studies. On the basis of limited data, the ministry has developed a standard that is designed to protect all workers from isocyanates induced irritation and to minimize the incidence of initial sensitizations, abnormal loss of pulmonary function and asthmatic reactions. While council understands the reasons for the ministry's decision, it wishes to note that, at the exposure limits proposed, the health of some workers will not be fully protected. In order to reduce the possibility that these individuals will be adversely affected by isocyanate exposures, council suggests that two additional provisions (variants of which have appeared in other designated substances regulations) be incorporated into the proposed isocyanates standard. These are a) the requirement that employers adopt new, demonstrably effective engineering controls and related technological innovations to reduce exposures in a work site, where this is reasonable or practical,[13] and b) the stipulation that an isocyanates control program include a formal training program for supervisors and workers on the health effects of isocyanates and the measures and procedures required under the control program.[14] Council believes that the first provision will more clearly define an employer's ongoing duty to reduce isocyanate exposures to the lowest practical level, while the latter provision should help to ensure that all affected individuals are made aware of the risks of isocyanate exposures.

b) *The Potential Carcinogenic Effects Associated with Exposure to TDI and MDI*

In its background materials, the ministry discusses a number of studies, conducted by the National Toxicology Program, that have investigated the mutagenic and carcinogenic effects of various isocyanate compounds. The results of these studies may be summarized as follows:

i) Both TDI and MDI are mutagenic in *Salmonella typhimurium*.
ii) On the basis of preliminary reports, TDI is carcinogenic in both rats and mice.

In light of these findings, the task force asked the ministry whether the exposure limits contained in the proposed regulation would likely prevent the development of tumours in workers who are exposed to these compounds. In addressing this concern, ministry officials indicated that, due to the paucity of studies in the area and the problems that arise in extrapolating data from one species to another, this question cannot be answered with certainty. The ministry hypothesized, however, that since TDI is mutagenic in bacteria and produces tumours in two mammalian species, this compound could be classified as a genotoxic carcinogen (i.e. a substance that can induce mutations by damaging genes). In such a case, a risk assessment is conducted and a level of acceptable risk must be chosen.[15] Ministry officials indicated, however, that until such time as the animal studies are officially published, it would be premature to extrapolate the results obtained to humans with a view towards establishing an appropriate exposure limit. In the interim, the ministry expressed the view that the requirement contained in sub-section 4(1) of the proposed regulation to reduce exposures to the lowest practical level should minimize the risks associated with exposure to all isocyanate compounds. Ministry officials also undertook to review the exposure levels contained in the standard once the formal results of the animal studies are available.

c) *The Economic and Technological Feasibility of Achieving i) the Exposure Levels Set Out in the Proposed Regulation and ii) More Stringent Control Levels*

During the January 28 meeting, task force members asked the ministry to set out its reasons for believing that the proposed TWAEL of 0.005 ppm would be both economically and technologically feasible. The task force also sought the ministry's view on the related question of whether firms in Ontario could achieve more stringent exposure levels. In responding to these questions, the ministry indicated that, based on a review of the air monitoring data collected by the Occupational Health Branch of the ministry, 65 per cent of the firms that employ TDI in their manufacturing processes are presently able to meet the proposed TWAEL.

The basis for concluding that this level can be attained is that no more than one out of a series of samples taken in a plant at a given point in time exceeded the 0.005 ppm limit. The ministry pointed out, however, that many of the samples collected were obtained through area monitoring procedures conducted over relatively short periods of time. Consequently, the data examined could not, strictly speaking, be related to time-weighted average exposures calculated over a 40-hour period. Ministry officials were of the opinion, however, that had data from personal monitoring sources been available, the results would have shown that an even higher percentage of firms were able to comply with the proposed exposure limit. The ministry also indicated that 94 per cent of the firms that use MDI in their operations could comply with the 0.005 ppm exposure limit. Ministry officials stated that the question of whether Ontario industries could achieve more stringent control levels could not be answered quite as definitively. Based on the available evidence, however, the ministry concluded that exposure levels below the TWAEL of 0.005 ppm would be more difficult to attain. On a related point, the ministry noted that detailed discussions had been conducted with industry representatives on the economic feasibility of the exposure limits contained in the first and second drafts of the regulation. The most serious objection to the 0.005 TWAEL came from three companies that were members of the Canadian Flexible Foam Association. Each company provided the ministry with estimates of the capital expenditures (ranging from $300,000 to just over $400,000) and annual operating expenses (ranging from $250,000 to $300,000) that would have to be incurred in order to comply with the proposed regulation. In light of more recent information, however, the ministry concluded that the estimates were excessive.

In previous advisory memoranda, council has observed that the data obtained from the ministry's routine monitoring of Ontario worksites are not comprehensive enough to permit one to calculate, in an accurate fashion, the percentage of firms that are able to achieve particular Time-Weighted Average Exposure Limits. Council has also concluded that, in order for such information to be obtained, it would be necessary to conduct fairly detailed surveys in those plants where hazardous agents are present. In the case of isocyanates, council believes that such surveys could generate useful data on:

i) The ability of individual firms to meet specific exposure limits over time.
ii) The engineering controls and work practices that are most effective in reducing isocyanate emissions.
iii) The number of firms in the province that are able to control exposures below the TWAEL.

In the result, ministry officials could obtain a valuable frame of reference from which to judge whether an employer has reduced isocyanate exposures to the 'lowest practical level' and, more generally, whether there is a need to develop a more stringent standard. Council hopes that the necessary information can be gathered once the proposed regulation is in place.

d) *The Decision to Calculate Time-Weighted Average Exposure Limits Over a 40-Hour Sampling Period*

A further point raised during the January 28 meeting concerned the ministry's decision to calculate Time-Weighted Average Exposure Limits for isocyanates (which are sensitizing agents) over a 40-hour period, rather than over the customary 8-hour time frame. In addressing this point, the ministry indicated that the key question is whether the use of an extended sampling period will increase the risk of sensitization. On the basis of the evidence reviewed, the ministry has concluded that exposure to high concentrations of isocyanates over a short period of time (referred to as 'peaking') likely does not produce a greater sensitizing effect than exposure to lower concentrations over extended lengths of time. Rather, the risk of sensitization is more apt to be related to the total dose of isocyanates delivered to the lungs. For this reason, and on the basis that the Maximum Exposure Limit prescribed in the regulation should effectively protect against excess exposures, the ministry deemed it appropriate to calculate TWAELs over the longer and more flexible 40-hour period.

e) *The Decision to Set Exposure Limits for Only Four Isocyanate Compounds*

During the January 28 meeting, task force members asked the ministry to elaborate on its reasons for prescribing exposure limits for only four isocyanate compounds, namely TDI, MDI, HDI and IPDI. In response to this question, the ministry indicated that, while analytical methods exist to measure the concentrations of monomeric isocyanates in the air (of which TDI, MDI, HDI and IPDI are examples) comparable techniques have not been developed for the sampling of polymers and prepolymers (collectively known as polymeric isocyanates).[16] As a result, exposure levels can be established and enforced for monomeric isocyanates, but not for the polymeric forms of the substance. The ministry then stated that TDI, HDI, MDI and IPDI had been singled out for special treatment because of their widespread use in the province. Ministry officials also pointed out, in response to a further question, that it would be fairly easy to prepare laboratory codes for other monomeric isocyanates if and when these compounds are introduced into the jurisdiction. It was also emphasized that the proposed regulation applies to all organic isocyanates. In this respect, the standard could be revised to deal with new isocyanates, without the need to develop a separate regulation.

f) *Alternative Policy Approaches for the Control of Isocyanate Exposures*

In the background materials provided by the ministry, it is stated that 'substitution of less volatile diisocyanates, where feasible, can result in lower airborne concentrations, although this may not be sufficient when high temperatures are involved.'[17] During the January 28 meeting, task force members wished to know whether the ministry had any plans to disseminate information on the availability of less hazardous forms of isocyanates to employers and to members of joint health and safety committees. In response to this question, ministry officials indicated that it is not the government's role to tell industry what substances should be used for its own commercial advantage. While the principle of substitution may be desirable in theory, the less hazardous isocyanates that are available may not be suitable for a particular application. Thus, it must be left to the employer to determine when substitute materials might be utilized in a particular industrial process. Ministry officials also pointed out that information on the availability of substitutes can generally be obtained from suppliers.

Council can appreciate the reluctance of the ministry to become involved in production decisions. Members believe, however, that the ministry should assist in making information available to interested parties on the use of substitutes.

g) *Worker Removal and Subsequent Reinstatement*

At the January 28 meeting, task force members discussed with ministry officials the question of whether decisions on worker removal and subsequent reinstatement should be made by the physician chosen to supervise a plant's medical surveillance program (hereinafter referred to as the supervising physician) or by an outside medical specialist. In addressing this point, the ministry expressed the view that since the supervising physician typically has the most detailed knowledge of the exposure conditions found in the plant, this individual is in the best position to determine whether a worker's health is apt to deteriorate as a result of further exposure to isocyanates. Ministry officials indicated, however, that it would be desirable for supervising physicians to consult with experts before final decisions are made with respect to removal and subsequent reinstatement. It was also pointed out that the ministry would be prepared to offer assistance in difficult cases.

While council understands the position that the ministry is taking, it wishes to point out that not all supervising physicians will be possessed of sufficient expertise to evaluate the often subtle health effects associated with exposure to isocyanates. In this respect, members wonder whether it might not be appropriate to place a duty on supervising physicians to i) refer workers who are suffering from various signs and symptoms of isocyanate exposure (e.g. indications of sensitization or a 15 per cent decline in FEV_1) to a medical specialist and ii) consult with such a specialist when removal or return to work decisions are being contemplated. Council's objective in making these suggestions is to ensure that determinations about fitness for work are made on the basis of expert advice. Council also welcomes the ministry's offer to provide assistance in those situations where uncertainty exists about whether a worker should be removed from (and subsequently returned to) an isocyanates worksite.

3. The Legal Technical Process

As a result of discussions held between the ministry and council's task force, several changes of a legal or technical nature have been made to the codes that accompany the proposed isocyanates regulation. These amendments are set out below:

i) Sub-section 4(4)(a) of the Code for Medical Surveillance of Isocyanates Exposed Workers now prescribes that the suitability of a worker for further exposure to isocyanates must be reviewed after the worker has been referred for further assessment of a confirmed 15 per cent decline in pulmonary function test results. (In the previous version of the regulation, the review of the worker's continued suitability for exposure to isocynates had been left to the discretion of the supervising physician).

ii) Sub-section 4(4) of the Code for Medical Surveillance of Isocyanates Exposed Workers now provides some general guidance on the manner in which the terms 'unfit' and 'fit with limitations' are to be interpreted. According to the code, the term unfit may be appropriate for sensitized individuals who demonstrate known severe reactions. The term fit with limitations, on the other hand, may apply to a) sensitized individuals with mild and stable reaction patterns and b) individuals with hyper-reactive airways whose reactive levels can be specified.

iii) Sub-section 4(4) of the Code for Medical Surveillance of Isocyanates Exposed Workers now specifies that the supervising physician must make a decision with respect to when a worker who has been previously removed from an isocyanates worksite may be permitted to return to work.

iv) General Requirement 14 of the Code for Respiratory Equipment for Isocyanates now states that an employer is to keep records of the frequency of use by workers of respiratory equipment. (The previous draft had only required that the fact of respirator use be documented).

v) Sub-section 3(3)(h)(i) of the Code for Measuring Airborne Isocyanates now specifies that when sampling is being conducted to calculate TWAELs with respect to a work operation that lasts for more than an hour, samples of at least one hour must be taken. For those work operations that do not extend beyond an hour, one sample is to be taken during the period of the entire operation.

vi) Sub-section 3(3)(h)(ii) of the Code for Measuring Airborne Isocyanates now provides that when sampling is being conducted to calculate Maximum Exposure Limits, the monitoring period shall last for 15 minutes. (In the previous draft of the regulation, time limits for the calculation of MELs had not been prescribed).

Council wishes to make several additional points that relate to the legal-technical process. Council believes that the following items require further comment.

a) *The Relationship Between Sub-sections 4(1) and 4(2) of the Proposed Isocyanates Regulation*

Under sub-section 4(1) of the proposed isocyanates regulation, an employer is required to take all necessry measures and procedures by way of engineering controls, work practices and hygiene practices to reduce the time-weighted average exposure of a worker to the four monomeric isocyanates to the lowest practical level and, in any case, to a level not in excess of 0.005 ppm. Sub-section 4(2) states, however, that *notwithstanding* sub-section 4(1), an employer must ensure that a worker's exposure to any of these substances does not exceed 0.02 ppm. During the meeting of January 28, the task force expressed the concern that the use of the term 'notwithstanding' in sub-section 4(2) could cause some individuals to interpret section 4 to mean that as long as the Maximum Exposure Limit of 0.02 ppm is not exceeded, one need not comply with the duty to reduce exposures to the lowest practical level. Task force members wondered, in this respect, whether it would not be preferable to substitute the term 'in complying with' for 'notwithstanding' in order to emphasize that an employer's primary obligation is the reduction of isocyanates exposure to the lowest practical level. Members noted that the suggested phraseology had been included in sub-section 4(2) of the vinyl chloride regulation. In addressing this point, the ministry indicated that the use of the term 'notwithstanding' more effectively communicates the fact that the duties set out in sub-sections 4(1) and 4(2) are distinct. In this respect, the obligation to comply with the prescribed MEL should not in any way detract from the general obligation to reduce isocyanate exposures to the lowest practical level. The ministry then pointed out that the alternative phraseology would simply have specified one manner of complying with the duty outlined in sub-section 4(1).

While council understands the distinction that is being made, it would note that the vinyl chloride regulation still contains the wording that the ministry has judged to be less preferable.

b) *The Statutory Defence Made Available to an Employer under the Proposed Isocyanates Regulation*

Sub-section 4(5) of the proposed isocyanates regulation states that:

> 'On a prosecution for a failure to comply with sub-section 4(1) or sub-section 4(2), it shall be a defence for the employer to prove that he has complied with sub-section 4(1) or 4(2) and that a breach of sub-section 4(1) or 4(2) occurred solely because the worker failed to work in compliance with the work practices and hygiene practices in accordance with the provisions of the isocyanates control program and the employer has taken every precaution reasonable in the circumstances to require the worker to do so.'

During the January 28 meeting, task force members asked the ministry why a similar defence had not also been prescribed for contraventions of section 5(a) (the provision that requires an employer, whose workers are exposed to polymeric isocyanates to adopt and implement all such engineering controls, work practices and hygiene practices as are reasonable or practical). In response to this question, ministry officals indicated that sub-section 37(2)(b) of the *Occupational Health and Safety Act* already provides the employer with a defence against prosecution in those cases where the employer is charged with failing to ensure that the measures and procedures prescribed by regulation are carried out in the workplace. In order to take advantage of this defence, the employer must prove that he took every reasonable precaution to comply with the regulation. Because of the existence of sub-section 37(2)(b), the ministry considered that the inclusion of a separate defence within the proposed regulation would be superfluous. The ministry then indicated that it was necessary to prescribe a separate defence for contraventions to sub-sections 4(1) and 4(2) of the regulation since sub-section 37(2)(b) of the Act does not apply to those situations where an employer is required to maintain a particular exposure limit in the workplace.

c) *The Duty of an Employer to Protect the Health of Workers Who Are Exposed to Isocyanates Other than Those Specified in Sub-section 4(1) of the Proposed Isocyanates Regulation*

Pursuant to section 5 of the proposed regulation, an employer whose workers are exposed to isocyanates other than those referred to in sub-section 4(1) must i) adopt and implement all such engineering controls, work practices and hygiene practices as are reasonable and practical and ii) provide a worker who handles, dispenses or otherwise uses isocyanates and who is likely to inhale or come into contact with such compounds with appropriate personal protective equipment. During the January 28 meeting, task force members asked the ministry why an obligation had not been placed on employers to control exposures to these substances primarily through the use of engineering controls, work practices and hygiene practices and to employ respiratory equipment only where other measures were neither reasonable nor practical. The task force was particularly interested in the response to this question, since the ministry had indicated elsewhere in its background documentation that the use of respiratory equipment should be controlled rigorously where viable engineering options are available.[18] In addressing this point, ministry officials emphasized that the duties set out in section 5 are conjunctive. That is to say, an employer must i) adopt engineering controls, work practices and hygiene practices *and* ii) provide respiratory equipment in order to comply with the standard. The ministry then indicated that since there is no reliable method for measuring airborne concentrations of polymeric isocyanates (the class of substances to which section 5 applies) it is extremely difficult to determine whether individual workers are being exposed to hazardous amounts of these compounds. In order to minimize the health risks associated with such exposures, the ministry deemed it advisable to require that respiratory equipment be distributed and worn. In pursuing the discussion, task force members asked the ministry two further questions: Who will decide what engineering controls are to be introduced? Under what circumstances will an employer be permitted to fulfil his obligations under section 5 exclusively through the distribution of respiratory equipment? In responding to these questions, the ministry indicated that these are matters for the joint health and safety committees to resolve. Where committee members cannot reach a consensus on these issues, a ministry inspector may be called in to mediate the dispute and, if necessary, to issue an order. Task force members then pointed out that, under sub-section 4(6) of the proposed regulation (the provision which sets out the occasions when respiratory equipment may be employed in lieu of engineering controls to limit worker exposure to the four monomeric isocyanates) the onus falls on the employer to prove that the adoption of engineering controls was neither reasonable nor practical. Under section 5, on the other hand, the onus would be reversed. On a prosecution, the ministry would have to prove that the engineering controls that an employer ought to have adopted were reasonable and practical. Task force members wondered whether it was appropriate that the onus of proof be made to fall on different parties, depending on the nature of the isocyanate to which a worker is exposed. In addressing this point, the ministry acknowledged that an inconsistency exists. However, because of the difficulties involved in the measurement of polymeric isocyanates, it was necessary to phrase sections 4 and 5 differently.

Council appreciates that the development of a regulatory strategy for the control of environmental agents that cannot be measured is a difficult task. Members believe, however, that occupational health regulations should adhere, wherever practicable, to the general principle that exposures should be reduced through the use of engineering controls. In the case of polymeric isocyanates, council wonders whether this objective could be achieved by placing in the proposed regulation (or in an accompanying schedule) a list of basic engineering controls, work practices and hygiene practices which, if incorporated, would reduce the likelihood of worker exposure to elevated concentrations of these compounds. Council also has a concern about the ministry's decision to require that all workers who are exposed to polymeric isocyanates wear respiratory equipment on a continuous basis. While the ministry has indicated that prepolymers containing free isocyanate groups can present a serious hazard under certain circumstances,[19] council believes that other situations may exist where, owing to the nature of the work operation or the quality of the engineering controls that have been introduced, the mandatory use of respirators may not be essential to preserve worker health. It is important to note, in this respect, that the health of some employees might actually deteriorate because of the physical strain associated with respirator use. On this basis, council wonders whether it would not be more appropriate for the proposed regulation to specify that employers must *offer* respirators to all workers who might become exposed to polymeric isocyanates, and for the ministry to then determine, on a case by case basis, whether employees must wear these devices. It would also be important to ensure that workers are briefed fully on the advantages and possible risks associated with respirator use.

d) *The Retention by Physicians of Worker Exposure Records*

During the January 28 meeting with ministry officials, several points were raised that pertain to sub-section 16(1) of the proposed isocyanates regulation. This provision reads as follows:

> 'The records of medical examinations and clinical tests of a worker obtained and made under this Regulation and of the exposures of the worker to airborne isocyanates furnished by the employer under subsection 15(2) shall be kept in a secure place by the physician who has conducted the examinations and tests or under whose supervision the examinations and tests have been made for a) a period of forty years from the time such records were first made; or b) a period of twenty years from the time the last of such records were made.'

Members of the task force wished to know whether sub-section 16(1) could be complied with through administrative arrangements wherein:

i)worker exposure records are housed in a plant's industrial hygiene department, with access granted to the supervising physician, or ii) exposure information is stored in a common data base which the supervising physician can access through a computer terminal. In addressing these questions, ministry officials indicated that the supervising physician must have full access to the exposure records of individual workers. The ministry stated, furthermore, that a variety of administrative arrangements (including the ones referred to by council's task force) would be acceptable, provided that, once an employee has left an isocyanates work site or the time periods specified in sub-section 16(1) have elapsed, it would be a relatively simple matter to bring together information on the worker's occupational exposures and medical status.

In council's view, the explanation provided by the ministry is sensible. Members also feel that it would be desirable for this interpretation to be distributed to all work sites where designated substances are in use.

e) *The Wording Contained in Sub-Sections 4(4)(a) and (b) of the Code for Medical Surveillance of Isocyanates Exposed Workers*

A further point raised during the January 28 meeting concerned the precision of the wording contained in sub-sections 4(4)(a) and (b) of the Code for Medical Surveillance of Isocyanates Exposed Workers. These provisions read as follows:

> 'If the pulmonary function tests show a 15% decline in FEV_1 during the work shift or work week or from the preplacement or periodic test, and this is confirmed, the worker shall be referred for further investigation and his suitability for further exposure to isocyanates shall be reviewed.'
>
> 'If the worker shows evidence of sensitization to isocyanates he shall be assessed and the physician shall advise on his suitability for further exposure.'

In order to ensure that all parties understand the intent of these sub-sections, council wonders whether the following points could be clarified:

i) Must a worker with a 15 per cent decline in pulmonary function be referred for investigation to a medical specialist?
ii) Under the same sub-section, must the supervising physician review a worker's suitability for continued exposure to isocyanates with a medical specialist?
iii) Would the intent of sub-section 4(4)(a) be more clearly articulated if the phrase 'during the period between annual testing' was substituted for 'from the preplacement or periodic tests'?
iv) Is the supervising physician or a medical specialist required to assess a worker who shows evidence of sensitization?
v) Is council correct in assuming that the term 'physician' as employed in sub-section (b) refers to a supervising physician rather than a medical specialist?

Council would encourage the ministry to refine the present wording of these sub-sections where appropriate.

f) *An Employee's Entitlement to Workers' Compensation Benefits*

During the January 28 meeting, task force members asked for clarification on the question of whether a worker who had been removed from an isocyanates exposure environment because of i) sensitization to isocyanates or ii) a 15 per cent decline in FEV-1 test results would be entitled to receive workers' compensation benefits (including a retraining allowance). In addressing this point, ministry officials indicated that the Workers' Compensation Board (WCB) judges each case on its own merits. Where an employee has been removed from an isocyanates job site, the board will first evaluate his health status. This assessment will be based on a review of the worker's medical history and the results of pulmonary function tests. Challenge testing may also be conducted. Once these medical procedures have been completed, the employee's work situation will be reviewed by WCB staff. Where removal from isocyanates exposure is considered necessary, an initial effort will be made to place the worker in a different plant location. If this alternative is not feasible, the worker may be provided with different employment or retrained. The ministry pointed out that compensation payments for loss of lung capacity will not be based entirely on the percentage decline in pulmonary function test results, but rather on an overall assessment of the worker. Ministry officials also indicated that, as a rule, the board will not provide compensation to an employee who has been removed from work because of sensitization to isocyanates. The ministry added, however, that the government might enlarge the scope for compensation in the future, once the reports of the Weiler Commission and the Select Committee on the Ombudsman have been considered.

Council appreciates that several government appointed groups are presently examining the general issue of compensation for industrial disease. Members nonetheless believe that the ministry, in conjunction with the Workers' Compensation Board, should develop, at the earliest opportunity, a special placement and retraining program for employees who i) have been removed from work as a direct result of the provisions contained in the isocyanates regulation and ii) are unable to return to an isocyanates exposure environment.

CONCLUSION

In previous advisory memoranda, council has observed that the development of occupational health regulations is a difficult undertaking, particularly in the context of an open consultative process. In the case of the proposed isocyanates standard, it is clear that the dialogue conducted between the ministry and members of the public has caused major changes to be made to the regulation and accompanying codes. Council is also highly appreciative of the open attitude taken by ministry officials with respect to the points raised by its Task Force on Regulations.

In formulating a strategy for the control of isocyanate exposures in the workplace, the ministry faced a complex task. This was the case because a) exposure to isocyanates can produce an array of adverse health effects, b) some health outcomes (notably asthmatic reactions in previously sensitized workers) may occur at extremely low levels of exposure, c) the significance of some health effects (in particular the loss of pulmonary function) is unclear, and d) the quality of the epidemiological studies in the area is generally poor. In the face of this uncertainty, the ministry has made the decision to establish exposure limits that will protect all workers from isocyanates induced irritation, and the great majority of workers from the risk of initial sensitization and the gradual, abnormal loss of pulmonary function. Ministry officials have also concluded that it would be neither economically nor technologically feasible to develop a standard to protect the health of previously sensitized workers who continue to work in isocyanate exposure environments. The ministry has, however, amended the proposed regulation to require that all isocyanate exposures be reduced to the lowest practical level.

In developing the proposed isocyanates standard, the ministry has also had to evaluate the preliminary results of animal studies which suggest that TDI - the most commonly used isocyanate compound - is carcinogenic in both rats and mice. Ministry officials have pointed out that the formal results of these studies will not be available for several months. Once this information is received, the ministry will assess the implications of the test results for humans and determine whether the control levels specified in the regulation should be adjusted. Council agrees with the ministry that the standard should be reassessed once the animal data become available. Moreover, council members feel that, in view of the present inadequacies in the scientific literature, the proposed exposure limits for the monomeric isocyanates, and the regulatory strategy adopted for the control of polymeric isocyanates, should be reviewed a) each time a significant new study is published[20] and b) in any event, after a period of three years has elapsed from the date that the regulation is promulgated.

In its review of the analytical process, council has noted that the proposed isocyanates regulation, unlike some other standards that the ministry has promulgated, will not protect the health of all employees who suffer exposures in the workplace. In this respect, council has recommended that several additional provisions be incorporated into the proposed regulation to enhance the strength and fairness of the standard. The suggested provisions include a) the requirement that employers adopt new, demonstrably effective engineering controls to reduce worker exposure to isocyanates, b) the stipulation that medical specialists be consulted before removal and return to work decisions are made, and c) the requirement that arrangements for the training of supervisors and workers on the health effects of isocyanates be incorporated into a plant's control program. Council has also commented on the need for a special placement and retraining program for employees who have been removed from work as a direct result of the provisions contained in the isocyanates regulation.

On a somewhat different point, council has suggested that, once the proposed standard is in place, the ministry monitor, in a systematic fashion, the control levels that are actually being achieved in different plants. In council's view, the information derived from such a survey could provide the ministry with a valuable frame of reference from which to judge whether individual employers have reduced isocyanate exposures to the 'lowest practical level'.

It has also come to council's attention that Dr. Keith Morgan of the University of Western Ontario will shortly publish a paper reanalysing the pulmonary function data that formed the basis for the conclusions reached in the

Wegman group of studies. It might therefore be appropriate for ministry officials to review Dr. Morgan's work before a final standard is promulgated. Council would also note that the methodology employed in the National Toxicology Program animal bio-assays has been criticized in a recent article.[21]

To conclude, council members wish to acknowledge the considerable effort that ministry staff have put into the development of the proposed isocyanates regulation. It is evident that the open consultative process pursued by the ministry and the response to public comment have contributed to the development of a more effective regulation for the control of isocyanate exposures in the workplace.

Footnotes

1. The monomeric version of an isocyanate represents the single molecular unit of the substance.
2. Diem, J., *et al*, Five-Year Longitudinal Study of Workers Employed in a New Toluene Diisocyanate Manufacturing Plant. In: American Review of Respiratory Disease, vol. 126, 1982, p. 420.
3. In a longitudinal study design, the cohort group that is investigated consists of workers whose health status is monitored from the date of their arrival in a plant. The major advantage of this approach is that it permits researchers to evaluate the morbidity experience of both present and former employees.
4. Weill, H., *et al*, Respiratory and Immunologic Evaluation of Isocyanate Exposure in a New Manufacturing Plant. Study prepared for the National Institute for Occupational Safety and Health, June 1981, p. 4.
5. A worker's FEV_1 test results were only included in the longitudinal analysis, where the individual had a minimum of three pulmonary function measurements. Two-hundred and twenty-three men satisfied this inclusion criterion. Diem, H., *op. cit.*, p. 422.
6. *Ibid.*, p. 428.
7. In a cross-sectional study design, only those workers who are employed in a work site at a particular point in time are considered for investigation. For a fuller discussion of the inherent strengths and weaknesses of longitudinal and cross-sectional study designs, the reader is invited to consult Advisory Memorandum 82-V on Principles and Procedures for the Interpretation of Epidemiological Studies, which appears in the advisory council's Fifth Annual Report.
8. Wegman, H., *et al*, Accelerated Loss of FEV_1 in Polyurethane Production Workers: A Four-Year Prospective Study. In: American Journal of Industrial Medicine, vol. 3, 1982, p. 209.
9. Musk, A., *et al*, Absence of Respiratory Effects in Subjects Exposed to Low Concentrations of TDI and MDI. In: Journal of Occupational Medicine, vol. 24, no. 10, October 1982, p. 746.
10. Wegman, H., *op. cit.*, p. 215.
11. Musk, A., *op. cit.*, p. 749.
12. National Institute for Occupational Safety and Health, Criteria for a Recommended Standard. . . . Occupational Exposure to Diisocyanates, September 1978, p. 96.
13. A similar sort of provision appears in sub-section 8(1) of the Regulation respecting Coke Oven Emissions (O. Reg. 517/82).

14. See sub-section 7(2)(f) of the Regulation respecting Coke Oven Emissions.
15. Ontario Ministry of Labour, The Report on the Designation of Isocyanates in Ontario, November 1982, p. G.40.
16. Polymeric isocyanates are compounds that consist of a number of monomeric isocyanate units that are joined together.
17. Ontario Ministry of Labour, *op. cit.*, p. 4.7.
18. *Ibid.*, p. 6.39.
19. *Ibid.*, p. 6.5.
20. Of particular interest in this regard will be a historical prospective cohort study that NIOSH plans to conduct on the relationship between exposure to TDI and cancer mortality.
21. See Chemical Regulations Reporter, September 24, 1982, p. 756.

APPENDIX I

Agenda for Discussion

1) *The Epidemiological Studies Relied Upon to Establish the 0.005 Parts per Million Time-Weighted Average Exposure Limit for TDI, MDI, HDI AND IPDI*

   The task force would like to review with ministry officials the major epidemiological studies that have been relied upon to establish a 0.005 ppm TWAEL for TDI, MDI, HDI and IPDI (hereinafter referred to as monomeric isocyanates). Task force members would also ask the ministry to comment on the quality of the evidence presented in each of these studies.

2) *Worker Sensitization to Isocyanates*

   Could the ministry elaborate on its reasons for believing that a Time-Weighted Average Exposure Limit of 0.005 ppm for monomeric isocyanates (with permissible excursions up to 0.02 ppm) will prevent workers from becoming sensitized to these substances?

3) *The Protection of Workers Who Have Previously Been Sensitized to Isocyanates*

   The task force would like to explore with ministry officials the rationale for not developing a standard that will protect the health of workers who have been previously sensitized to isocyanates.

4) *The Economic and Technological Feasibility of Achieving Stringent Control Levels for Isocyanates*

   Could the ministry set out, for the benefit of task force members, its reasons for believing that the TWAEL of 0.005 ppm set for monomeric isocyanates will be both technologically and economically feasible? On a related point, could the ministry elaborate on the evidence that it relies upon for the propositions that a) '[The] establishment of an exposure limit to protect previously sensitized workers is not possible at this time' and that 'Levels [to which sensitized workers respond] are probably unachievable with current industrial controls?'

5) *The Potential Carcinogenic Effects Associated With Exposure to Isocyanates*

   In its background materials, the ministry indicates that TDI has been shown to be carcinogenic in two mammalian species. On this basis, it is suggested that the substance may also cause cancer in humans. From the ministry's initial review of these findings, task force members would like to know whether the TWAEL of 0.005 ppm which is proposed for TDI will be stringent enough to guard against the possible development of tumours in workers who may be exposed to this substance. The task force also wishes to know whether the ministry will reconsider the exposure limits set out in the proposed regulation once the formal results of the animal studies are published.

6) *The Decision to Calculate Time-Weighted Average Exposure Limits Over a 40-Hour Sampling Period*

The task force would like to hear discussion on the question of whether it is desirable to calculate Time-Weighted Average Exposure Limits over a 40-hour period for sensitizing agents.

7) *The Rationale for the Choice of the Maximum Exposure Limit Contained in the Proposed Regulation*

Could the ministry elaborate on its rationale for prescribing a Maximum Exposure Limit for TDI, MDI, HDI and IPDI that is four times as high as the accompanying Time-Weighted Average Exposure Limit?

On a related point, could the ministry state whether there exists a sampling method that permits instantaneous measurements of isocyanate levels to be taken?

8) *The Toxicity of Different Types of Isocyanates*

Could the ministry clarify for task force members whether (as indicated on page G.4 of the background materials) isocyanates with larger molecular weights have lower toxicity, or (as stated on page 4.6 of the same document) that 'all isocyanates can be considered roughly of equal toxicity if present in air in similar concentrations?'

9) *The Decision to Set Exposure Limits for Only Four Isocyanate Substances*

The task force would like the ministry to elaborate on its reasons for prescribing exposure limits for only four isocyanate compounds.

10) *The Duty of an Employer to Protect the Health of Workers Who Are Exposed to Isocyanates Other Than Those Specified in Sub-section 4(1) of the Proposed Regulation*

Pursuant to section 5 of the proposed regulation, an employer whose workers are exposed to isocyanates other than those referred to in subsection 4(1) must a) adopt and implement all such engineering controls, work practices and hygiene practices as are reasonable and practical and b) provide a worker who handles, dispenses or otherwise uses isocyanates, and who is likely to inhale or come into contact with the substance, with appropriate personal protective equipment. Could the ministry explain, for the benefit of task force members, why an obligation has not been placed on employers to control worker exposures to this group of isocyanates *primarily* through the use of engineering controls, work practices and hygiene practices?

11) *The Ministry's Decision Not to Require That Airborne Monitoring be Conducted for the Isocyanates Referred to in Section 5 of the Regulation (Hereinafter Referred to as Polymeric Isocyanates)*

Could the ministry set out its reasons for not prescribing, in sub-section 8(2) of the proposed regulation, that airborne monitoring be conducted to measure the levels of polymeric isocyanates in the workplace?

12) *The Substitution of Less Hazardous Forms of Isocyanates*

On page 4.7 of the background materials supplied to the advisory council, the ministry states that 'Substitution of less volatile diisocyanates, where feasible, can result in lower airborne concentrations, although this may not be sufficient when high temperatures are involved.' Could the ministry state whether it has any plans to disseminate information on the availability of less hazardous forms of isocyanates to employers and to members of joint health and safety committees?

13) *The Relationship Between Sub-sections 4(1) and 4(2) of the Proposed Isocyanates Regulation*

Under sub-section 4(1) of the proposed isocyanates regulation, an employer is required to take all necessary measures and procedures by way of engineering controls, work practices and hygiene practices to reduce the time-weighted exposure of a worker to monomeric isocyanates to the lowest practical level and, in any case, to a level not in excess of 0.005 parts isocyanate per million parts air. Sub-section 4(2) states, however, that notwithstanding sub-section 4(1), an employer must ensure that a worker's exposure to any of these isocyanates does not exceed 0.02 ppm. Task force members have a concern that the use of the term 'notwithstanding' in sub-section 4(2) could cause some individuals to interpret section 4 to mean that as long as the Maximum Exposure Limit of 0.02 ppm is not exceeded, one need not comply with the duty to reduce exposures to the lowest practical level. The task force wonders whether it would not be desirable to employ the term 'in complying with' rather than 'notwithstanding' in order to emphasize that an employer's primary obligation is the reduction of isocyanates exposure to the lowest practical level. Members would note that the suggested phraseology has been applied in sub-section 4(2) of the vinyl chloride regulation.

14) *The Statutory Defence Available to the Employer Under Sub-section 4(5) of the Proposed Isocyanates Regulation*

Sub-section 4(5) of the proposed isocyanates regulation states that 'On a prosecution for a failure to comply with sub-section 4(1) [the provision that requires employers to reduce exposures to monomeric isocyanates to the lowest practical level and, in any event, to a time-weighted average not in excess of 0.005 ppm] or sub-section 4(2) [the provision that prescribes a Maximum Exposure Limit of 0.02 ppm for monomeric isocyanates], it shall be a defence for the employer to prove that he has complied with sub-section 4(1) or 4(2) and that a breach of sub-section 4(1) or 4(2) occurred solely because the worker failed to work in compliance with the work practices and hygiene practices in accordance with the provisions of the isocyanates control program and the employer has taken every precaution reasonable in the circumstances to require the worker to do so.' The task force would like to hear discussion on the question of whether it would be appropriate to prescribe a similar defence for contraventions of section 5(a) [the provision that requires an employer, whose workers are exposed to polymeric isocyanates, to adopt and implement all such engineering controls, work practices and hygiene practices as are reasonable or practical].

15) *The Code for Medical Surveillance of Isocyanates Exposed Workers*

The task force would also like to discuss several points that relate to sub-sections 4(4)(a) and (b) of the Code for Medical Surveillance of Isocyanates Exposed Workers. The two sub-sections read as follows:

> 'If the pulmonary function tests show a 15% decline in FEV_1 during the work shift or work week, or from the preplacement or previous periodic test, and this is confirmed, the worker shall be referred for further investigation and his suitability for further exposure to isocyanates should be reviewed.
>
> If the worker shows evidence of sensitization to isocyanates he shall be assessed and the physician shall advise on his suitability for further exposure.'

Could the ministry clarify, for the benefit of task force members:

a) The rationale for not making the review specified in sub-section 4(4)(a) mandatory when a worker's FEV_1 test results have declined by 15 per cent?
b) Whether the assessment referred to in sub-section 4(4)(b) must be conducted by the physician supervising the medical surveillance program in a plant or by some other health professional?
c) The rationale for not setting out guidelines in the code to help physicians determine when a worker will be judged 'unfit' or 'fit with limitations' for continued exposure to isocyanates?

16) *Return to Work*

Could the ministry elaborate on its reasons for not including a provision in the Code for Medical Surveillance of Isocyanates Exposed Workers that would require a plant physician to determine when a worker previously removed from an isocyanates exposure environment might be permitted to return to work?

17) *An Employee's Entitlement to Workers' Compensation Benefits*

Could the ministry indicate, from its discussions with the WCB, whether an employee who has been removed from an isocyanates exposure environment because of a) sensitization to isocyanates or b) a 15 per cent decline in FEV_1 test results will be eligible to receive workers' compensation benefits?

18) *Information Regarding the Use of Respirators*

Could the ministry explain, for the benefit of task force members, why General Requirement 14 of the Code for Respiratory Equipment for Isocyanates does not specify that records of the *frequency* of use of respiratory equipment and its type are to be kept? This wording, task force members would note, has appeared in each of the other respiratory codes that have been promulgated to date.

Ontario

Advisory Council on
Occupational Health &
Occupational Safety

Office
of the
Chairman

400 University Avenue
Toronto, Ontario
M7A 1T7
416/965-2448

APPENDIX II

February 28, 1983

MEMORANDUM TO: Dr. A. E. Robinson
Assistant Deputy Minister
Occupational Health and Safety Division
400 University Avenue, 14th Floor

FROM: Mr. L. Heard, Chairman
Task Force on Principles and Procedures
for Setting Standards and Regulations
(Sub-committee on the Proposed Isocyanates
Regulation)

RE: Clarification of Certain Points Arising out of
the January 28, 1983 Meeting Between the Task
Force and the Ministry

The members of the task force have asked me to write to you in order to obtain further clarification on a number of points relating to the health effects studies that were employed to justify the exposure limits contained in the proposed regulation. The specific information sought is listed below:

1) On page 2 of the minutes which were taken at the meeting, Dr. Harding makes the statement that both Butcher and Peters are trying to retract statements that were made in the past about the effects of isocyanate exposures. Could the ministry: a) direct the task force to the studies in which these statements are made, and b) elaborate on why it believes that these older findings should now be disregarded?

2) On page 3 of the minutes, Dr. Harding refers to a study by Diem which indicates that workers will be protected at exposure levels below 0.005 ppm. Could the ministry supply the task force with a reference for this study?

3) On page 4 of the minutes, reference is made to early works by Peters and Wegman whose results the ministry has apparently employed to arrive at the TWAEL of 0.005 ppm for monomeric isocyanates (see page 3.6 of the background materials). Could the ministry provide the exact references for these studies?

4) Is the ministry continuing to base its choice of a 0.005 ppm TWAEL on extrapolations from the early Peters and Wegman studies or, alternatively, as seems to be suggested on pages 3 and 5 of the minutes, from the results of the Diem study?

5) Could the ministry indicate what weight has been accorded to the most recent studies of Musk and Wegman in establishing control limits for isocyanate exposures?

6) On page 6 of the minutes, Dr. Roos indicates that, from his review of the scientific literature, he had not run across any reports of new sensitizations at exposure levels below 0.02 ppm. Could the ministry verify that this proposition is supported by the most recent studies that have been conducted in the field?

7) Could the ministry provide information on the test protocol employed by the National Toxicology Program in its study of the carcinogenicity of TDI in rats and mice (in particular, how many animals were studied and what dosing regimen was employed)?

Task force members expect that once responses have been received to these questions, our group will be able to provide its advice on the quality of the analytical process employed to develop the isocyanates standard. The task force has asked that the replies to our questions be submitted in writing.

The staff of the advisory council would be pleased to elaborate on any of the points raised in this letter.

L. Heard
per ac

cc to: Task Force Members

Ontario
Ministry of
Labour

APPENDIX III

Occupational Health
and Safety Division

400 University Avenue
14th Floor
Toronto, Ontario. M7A 1T7

March 22, 1983

Mr. L. Heard,
Chairman,
Task Force on Principles
and Procedures for Setting
Standards and Regulations
(Sub-committee on the Proposed
Isocyanates Regulation)
Advisory Council on
Occupational Health &
Occupational Safety,
15th floor,
400 University Avenue,
Toronto, Ontario.
M7A 1T7

Dear Mr. Heard:

Please find attached a reply to the questions raised by the task force considering the isocyanates regulation.

Sincerely,

Ann E. Robinson

Ann E. Robinson, Ph.D., F.C.I.C.
Assistant Deputy Minister.

AER:er
Att.

RESPONSE TO THE ADVISORY COUNCIL REQUEST FOR ADDITIONAL INFORMATION ON ISOCYANATES

The following are responses to questions from the Advisory Council Task Force on the isocyanates regulation.

Rationale for the Exposure Limit

1. *Question: The Task Force would like to understand how the most recent works by Wegman and Musk affect the Ministry's rationale for the exposure limit.*

   Answer: The most recent work by Wegman, Musk et al, i.e. "Accelerated Loss of FEV-1 in Polyurethane Production Workers: A Four-Year Prospective Study" published in the Am. J. Ind. Med. 3:209-215 (1982) concluded that exposure in excess of 0.0035 ppm was related to a greater rate of decline of FEV-1 over the four-year period than that expected from aging.

   A criticism of this study is that the rate of decline of FEV-1 was determined from the slope of a line defined by only two data points. Pulmonary function testing was carried out in 1972 and 1976 and the change in FEV-1 was calculated as:

   > "... the difference between FEV-1 obtained Monday morning in 1972 and FEV-1 obtained Monday morning in 1976 (four-year FEV-1)."

   Reliance on only two data points may obscure variability in the data such as was detected in the study by Diem et al (see response to question 2).

   The work of Musk, Peters et al published in J. Occup. Med. Vol. 24, No. 10, October 1982, p.746-750, contains the following conclusion:

> "...mean exposures of less than 0.003 ppm appear to have no acute or chronic effect on pulmonary function at least with respect to symptoms and changes in FEV-1".

Since the conclusions of this study are essentially negative it does not in itself provide a good basis for rejecting the appropriateness of a time-weighted average exposure value of 0.005 ppm.

These studies have been considered in conjunction with other relevant studies in arriving at a conclusion as to an appropriate exposure limit.

2. *Question: Dr. Harding told the Task Force that both Butcher and Peters are trying to retract statements that were made in the past about the effects of isocyanates exposure. Could the Ministry direct the Task Force to the studies in which these statements are made?*

   Answer: The paper by Diem et al, of which Butcher is a co-author, contains an analysis (see page 3) of spurious results obtained earlier in their study and published in the Am. Rev. Resp. Dis. 1977, 116: 411-21. This analysis concludes that:

   > "...the bias associated with Survey 5 has no effect on the results reported here, although it did produce spurious results in our short-term analyses reported earlier".

Our own previous efforts to relate TDI exposures to annual lung function decline have also met with inexplicable early results. When we published the results of 2.5 yr of follow-up of this population, there was an apparent annual FEV_1 increase of 55 ml/yr (21). This increase, based on five data points, was recognized as implausible but was reported because extensive review of the data provided no reasons to reject the observations as invalid.

Before proceeding with the longer-term analysis reported here, we examined the FEV_1 values of 33 participants with valid spirometry at all nine surveys. A graph of mean FEV_1 by survey is presented in figure 3, together with the least squares straight line fit to these means. The line gives an FEV_1 annual change of −21 ml/yr. An obvious peak in mean FEV_1 occurs in October 1975, the date of the fifth survey. Both FVC and $FEF_{25-75\%}$ showed similar peaks at this point. The FEV_1 data were tested by the application of a linear model containing a bias term for each survey (18). The Survey 5 bias term of 134 ml was significant ($p = 0.001$). There was no significant bias for the remaining eight surveys. For these 33 subjects, a straight line fit to the first five data points gives an estimated FEV_1 annual change of 37 ml/yr. This indicates that the FEV_1 increase reported earlier was due to a systematic error of measurement at survey five. In the present analysis, we considered excluding the Survey 5 data but decided not to for three reasons: (*1*) we can find no explanation for the bias despite careful investigation; (*2*) because Survey 5 is close to the midpoint of the study, it has little effect on individual FEV_1 slope if there is at least one data point on either side of Survey 5; (*3*) when those participants in whom Survey 5 is either the first or last spirometric data point were dropped from the FEV_1 analysis, the results were unchanged. We thus conclude that the bias associated with Survey 5 has no effect on the results reported here, although it did produce spurious results in our short-term analyses reported earlier. That we are now able to identify and assess the effects of bias associated with a single survey shows an inherent strength of the multi-survey longitudinal study. In longitudinal studies of only two surveys, or in which data from only the first and last surveys are analyzed to compute annual change, it is not possible to detect or assess the effects of such biases.

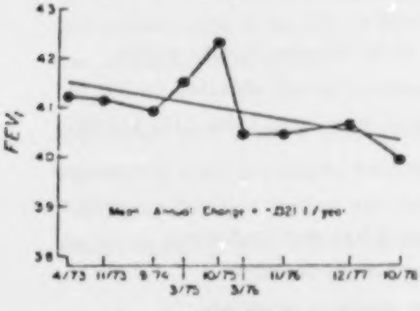

Fig 3 FEV_1 mean by visit for the 33 participants with complete spirometry at all 9 visits

The conclusion of Musk, Peters et al published in 1982 and quoted in the answer to question 1 above, conflicts with an earlier conclusion of Peters et al in J. Occup. Med. Vol. 16, No.4, April 1974, p. 258-260, where it is stated that:

> "... it would appear then that the exposure to levels of TDI as low as 0.002 ppm could result in chronic loss of pulmonary function".

3. *Question: Dr. Harding referred the Task Force to a study by Diem which indicates that workers will be protected at exposure levels below 0.005 ppm. Could the Ministry supply the Task Force with a reference for this study?*

Answer: The reference to this study is:

> Diem JE; Jones RN; Hendrick DJ; et al. Five-year longitudinal study of workers employed in a new toluene diisocyanate manufacturing plant. American Review Respiratory Disease. v.126, n.3, Sep. 1982, p.420-428.

The paper has been reproduced for ease of reference and is presented in Appendix A. *

4. *Question: The Ministry has referred to early works by Peters and Wegman whose results the Ministry has apparently employed to arrive at the TWAEL of 0.005 ppm for monomeric isocyanates (see page 3.6 of the background materials). Could the Ministry provide the exact references for these studies?*

Answer: Two studies are mentioned on page 3.6 as documenting significant loss of FEV-1 occurring over a number of years in exposed workers. These studies are reported in a series of papers whose references are given on page 7.2 (ref.no. 16-22). These studies, which document only one effect of exposure to isocyanates, were considered in conjunction with other more recent and comprehensive data in establishing an exposure value of 0.005 ppm (see reply to question 5).

* Note: Appendix A is not reproduced herein as received from the Ministry. See answer to Question 2 for relevant extract.

5. *Question: Is the Ministry continuing to base its choice of a 0.005 ppm TWAEL on extrapolations from the early Peters and Wegman studies or, alternatively, as seems to be suggested in discussion with the Task Force, from the results of the Diem study?*

   Answer: The time-weighted average exposure value of 0.005 ppm is not based on a consideration of any one study. The value chosen is based on a number of epidemiological studies including the recent work of Musk, Peters et al, Wegman, Musk et al, and Diem et al. The study by Diem et al is the most recent interpretation of data and it includes a critique of their own earlier work.

6. *Question: On page 6 of the minutes, Dr. Roos indicates that, from his review of the scientific literature, he had not run across any reports of new sensitizations at exposure levels below 0.02 ppm. Could the Ministry verify that this proposition is supported by the most recent studies that have been conducted in the field?*

   Answer: With reference to the statement on page 6 of the minutes, Dr. Roos did state that this was based on memory of work at least two years old and would have to be subject to confirmation. In fact the original source addresses itself only to challenge testing in persons with established sensitization. Therefore, the numbers quoted are not relevant in the present context.

   The staff of the Ministry are not aware of studies that have established the level at which new cases of sensitization can be prevented.

7. *Question: Could the Ministry provide information on the test protocol employed by the National Toxicology Progam in its study of the carcinogenicity of TDI in rats and mice (in particular, how many animals were studied, and what dosing regimen was employed)?*

Answer: TDI was administered to rats and mice by gavage in corn oil. Groups of female rats and mice (50 per group) were administered 60 or 120 mg/kg/day, five days a week for 105 or 106 weeks. Male rats were administered 30 or 60 mg/kg/day on the same schedule, while male mice received 120 or 240 mg/kg/day. The study concluded as follows:

> "TDI was carcinogenic in F344 rats causing subcutaneous fibromas and fibrosarcomas in females and males, pancreatic acinar cell adenomas in males, and pancreatic islet cell adenomas, neoplastic nodules of the liver and mammary gland fibroadenomas in females.
>
> It was carcinogenic in B6C3F1 female mice causing hemangiomas or hemangiosarcomas as well as hepatocellular adenomas. It was not carcinogenic in male mice."

The full report of this study is expected to be available in May of 1983.

Code for Medical Surveillance

8. *Question: Will the Ministry provide criteria to assist the examining physician in determining whether a worker shall be removed from work?*

Answer: Yes, changes have been made to the code of medical surveillance. The changes are as quoted below:

4. (3) Action Levels

(c) "The term 'unfit' may be appropriate for those sensitized individuals with known severe reactions. The term 'fit with limitations' may be appropriate for:

> i) Sensitized individuals with mild and stable reaction patterns; and
>
> ii) Individuals with hyper-reactive airways whose reactive levels can be specified."

9. *Question: Will the Ministry insert a statement concerning advice to the examining physician about when a worker should return to work?*

Answer: To clarify the role of the physician, the following sentence has been added to the code:

> "Subsequently, a decision shall be made by the physician as to when the worker may return to work."

The medical staff of the Ministry believes that any decision about the return of a worker to work must be made by the examining physician who will be fully informed about the case and therefore will be able to make a decision. The guidelines provided in the answer to question 8 above, will be of assistance to the physician concerned.

10. *Question: Will the Ministry insert a statement about an 'action level' for sensitized workers?*

Answer: Quantitative action levels such as those specified for lead and mercury are not appropriate in the case of isocyanates. A sensitized individual may never be able to return to work. However, the addition to the code dealt with in the answer to question 8 should help the physicians make decisions on the removal of workers from and return of workers to work with isocyanates.

Ceiling Limits

11. *Question: Should the schedule to calculate the time-weighted average exposure include a time period over which the sampling must be carried out to determine whether a worker has been exposed to concentrations of isocyanates in excess of the ceiling?*

Answer: Section 3(3)h of the two sampling methods contained in the Code for Measuring Airborne Isocyanates suggests minimum sampling times to obtain detectable levels of isocyanates for time-weighted average exposures. Reference to the subsection of the regulation which refers to maximum exposure values has been deleted from the Schedule; the appropriate place for suggestions as to the sampling period for maximum exposure estimations is in the code.

From knowledge of detection limits and the practicalities of analysing workplace air, it is suggested that 15 minute samples be taken for the estimation of maximum exposure values. This scheme is consistent with NIOSH practice.

Section 3(3)h has been reworded to give guidance on the sampling time for maximum exposure values. The reworded section is presented in Appendix B. The change does not guarantee that brief exposures to levels above the maximum exposure value will always be found.

APPENDIX B

SAMPLING METHOD FOR TDI OR MDI IN AIR

REVISED SECTION 3(3)(h)

(h) The frequency and duration of sampling shall be such that the samples taken will properly reflect the concentration of TDI or MDI to which workers are exposed.

(i) When sampling is being conducted to determine a time-weighted average exposure of a worker in an area where an operation lasts for more than one hour, samples of at least one hour in duration shall be taken to collect the amount of analyte in each sample that is required to measure the airborne concentration. When a work operation is less than one hour, one sample shall be taken during the period of the entire operation.

(ii) When sampling is being conducted to determine a maximum concentration value the sampling period shall be fifteen minutes.

SAMPLING METHOD FOR HDI, IPDI OR A MIXTURE OF DIISOCYANATES IN AIR

REVISED SECTION 3(3)(h)

(h) The frequency and duration of sampling shall be such that the samples taken will properly reflect the concentration of HDI, IPDI or the mixture of diisocyanates to which workers are exposed.

(i) When sampling is being conducted to determine a time-weighted average exposure of a worker in an area where an operation lasts for more than two hours, samples of at least two hours in duration shall be taken to collect the amount of analyte in each sample that is required to measure the airborne concentration. When a work operation is less than two hours, one sample shall be taken during the period of the entire operation.

(ii) When sampling is being conducted to determine a maximum concentration value the sampling period shall be fifteen minutes.

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August 24, 1983

J. F. Mustard, M.D.
Chairman
Advisory Council on Occupational
Health and Occupational Safety,
400 University Avenue,
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Toronto, Ontario.
M7A 1T7

Dear Dr. Mustard:

Thank you for submitting the Advisory Memorandum 83-I on the process followed for the development of the isocyanates regulation.

I was again pleased to note that Council has recognized the steps that have been taken to make possible public participation in the process of developing standards for designated substances. I am also grateful for Council's comments concerning the openness of my officials in discussions with the Task Force on Regulations.

Your memorandum raises a number of points, particularly with respect to the analytical and legal-technical processes. Rather than commenting on these matters, I am attaching the Occupational Health and Safety Division's response.

There are two items which I feel it appropriate for me to address. The first concerns the need for special retraining and placement programs for workers sensitized by exposure to isocyanates. Council has advised that my Ministry in conjunction with the Workers' Compensation Board, should develop, at the earliest opportunity, a special placement and retraining program for employees who:

1. have been removed from work as a direct result of the provisions contained in the isocyanates regulation; and
2. are unable to return to an isocyanates exposure environment.

... 2

Special difficulties faced by workers who become sensitized to isocyanates and who are unable to return to an isocyanate exposure environment are recognized. Many of these workers, particularly those with a residual disability may be eligible for Workers' Compensation Board rehabilitation and retraining programs. Eligibility for such programs is determined by the Board, and it is not automatic following removal from work as a result of the provisions of the isocyanates regulation.

A copy of a letter from Dr. Charles Stewart of the Workers' Compensation Board outlining current Board policy with respect to special rehabilitation assistance programs has recently been provided to Council. This letter also discusses some of the possible problems which may arise in extending such programs to workers who have become sensitized to isocyanates. I intend to raise this issue with the Chairman of the Workers' Compensation Board at our next meeting.

Furthermore, Council suggests that a number of issues with respect to the isocyanates regulation should be reviewed as new information becomes available.

In view of the present inadequacies of the scientific literature, it was suggested that the exposure limit for monomeric isocyanates, and the regulatory strategy adopted for polymeric isocyanates be reviewed whenever a significant new study is published, or in any event, after a period of three years. It was also suggested that new work by Dr. Keith Morgan be reviewed before a final standard is promulgated. Finally, Council drew attention to the commitment by officials of my Ministry to review the exposure levels established for isocyanates when the formal results of the carcinogenicity bioassay being conducted for TDI are published. Since the results of the work by Dr. Morgan were not available to the staff of the Ministry, it was not possible to review them before the regulation was filed. I wish to assure Council that all developments related to toxic substances are reviewed by my officials on an ongoing basis. The control strategy for polymeric isocyanates will be reviewed particularly in the light of any advances in analytical methods which would permit the measurement of the exposure of workers to these substances.

Please thank Council for a very thorough review of the regulation and insightful comment.

I enclose a copy of the isocyanates regulation which was filed on July 15, 1983.

Yours sincerely,

R. H. Ramsay,
Minister.

Enc.

COMMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY DIVISION ON ADVISORY MEMORANDUM 83-1 ON THE ISOCYANATES REGULATION

August , 1983

The memorandum raises a number of points, particularly with respect to the analytical and legal-technical processes. The major points are:

1. The recommendation for additional provisions in the regulation.
2. The desirability of conducting extensive monitoring surveys.
3. The dissemination of information on substitutes.
4. The need to specify the involvement of medical specialists in the Code for Medical Surveillance.
5. The use of the term "notwithstanding" in subsection 4(2) of the regulation.
6. The requirement that respirators be used when workers are exposed to polymeric isocyanates.
7. The inclusion of a list of basic engineering controls, work practices and hygiene practices in the regulation.
8. The distribution of information concerning acceptable administrative arrangements for storage of, and access to, exposure records of workers.

These issues will be responded to in order.

1. The recommendation for additional provisions in the regulation

Council notes that, at the exposure limits proposed, the health of some workers will not be fully protected. In order to reduce the possibility of such workers being adversely affected by exposure to isocyanates, Council has suggested that two additional provisions be incorporated into the proposed standard. These are: (a) the requirement that employers adopt new, demonstrably effective engineering controls and related technological innovations to reduce the exposures of workers, where this is reasonable or practical, and (b) the stipulation that an isocyanates control program should include a formal training program for supervisors and workers on the health effects of isocyanates and the measures and procedures required under the control program.

Short of banning the use of this substance it is difficult to state categorically that any regulation provides absolute protection against health hazards. The isocyanates regulation is not unique in this respect. Council clearly recognizes the difficulty of providing full protection for all workers. Advances in our understanding of the effects of isocyanates and in control technologies may make it possible in the future to further improve the protection afforded workers by regulation.

Employers have an ongoing duty under sections 4 and 5 of the regulation to reduce isocyanate exposures to the lowest practical level. This duty is clearly recognized by Council, and it is not necessary to include an additional section in the regulation to highlight this duty. While section 8(1) of the coke oven emissions regulation does further define the duty, that regulation is a special case because the technology required to ensure compliance with the exposure limits does not now exist in the case of coke oven emissions. The parties affected by the coke oven emissions regulation were involved in a unique manner in its development and section 8(1) and some other special provisions were included in the coke oven emissions regulation by agreement among all parties. In addition, isocyanates are found in many different industrial processes and are widely distributed across the province in large and small establishments. For these reasons the addition of this duty in the isocyanates regulation has not been made. However, the Ministry will monitor the regulation's effectiveness and if it appears that the addition suggested would be helpful, the appropriate amendment can be made.

The value of a training program designed to ensure that supervisors and workers are made aware of the potential health effects of isocyanates, and of the control measures and procedures required under the control program is acknowledged. Therefore, a new subsection 8(2)(g) has been added to the regulation as follows:

"8(2)(g) a training program for supervisors and workers on the health effects of isocyanates and the measures and procedures required under the isocyanates control program."

The word "formal", included in subsection 7(2)(f) of the coke oven emissions regulation has not been included as my officials foresee difficulties in the interpretation and enforcement of the phrase "a formal training program".

2. The desirability of conducting extensive monitoring surveys

In the memorandum, Council observes that data obtained from routine monitoring of Ontario workplaces by Ministry officials are not comprehensive enough to determine the percentage of firms that are able to achieve compliance with the proposed exposure limits. Council concludes that in order for such information to be obtained, detailed surveys would be required, and that such surveys would provide valuable data on:

i) the ability of individual firms to meet specific exposure limits over time;

ii) the engineering controls and work practices that are most effective in reducing isocyanate emissions; and

iii) the number of firms in the province that are able to control exposures below the time-weighted average exposure values.

Council expresses the hope that the necessary information can be gathered once the proposed regulation is in place.

The value of surveys of the scope envisaged by the Council is acknowledged. However, such surveys if undertaken by the Ministry would represent a substantial task. Data on the levels of hazardous agents in workplaces will be routinely generated when designated substances regulations are in place. Under the provisions of the regulations, the methods and procedures to be used to control the airborne concentration of substances must be specified in the control program and the records of the results of monitoring must be maintained. These records will be available for inspection and audit by the Ministry. With this background ministry officials will prepare advice on the most practical and efficient manner to collect this information.

3. The dissemination of information on substitutes

The Council has suggested that my Ministry assist in making information available to interested parties on the use of substitutes, particularly substitutes for the more volatile and hence, more hazardous forms of isocyanates.

As pointed out in discussions between Ministry officials and members of the Task Force on Regulations, a number of considerations other than the relative safety of the materials, goes into the selection of a substitute. These include the suitability of the substitute for the process, its availability, and cost. It would not be feasible for Ministry officials to systematically collect and disseminate information on substitutes for specific processes. However, where Ministry officials are aware of available substitutes, they have and will continue to advise employers that substitution be considered as a control measure.

4. The need to specify the involvement of medical specialists

A number of points raised in Council's memorandum refer to the Code for Medical Surveillance of Isocyanate Exposed Workers and question whether a medical specialist must be involved at a number of points in the medical surveillance program. Specifically, the following questions were posed:

i) Must a worker with a 15% decline in pulmonary function be referred for investigation to a medical specialist?

ii) Must the supervising physician review the suitability of a worker for continued exposure to isocyanates with a medical specialist?

iii) Is the supervising physician or a medical specialist required to assess a worker who shows evidence of sensitization?

iv) Is Council correct in assuming that the term "physician" as employed in sub-section 4(3)(b) refers to a supervising physician, rather than a medical specialist?

v) Might it not be appropriate to place a duty on supervising physicians to consult with a medical specialist when removal or return to work decisions are being contemplated?

The Code for Medical Surveillance of Isocyanate Exposed Workers requires that where a worker suffers a 15% decline in certain pulmonary function tests, the worker be referred for further investigation and his suitability for further exposure to isocyanates be assessed. In order to clarify the duty of the examining physician to seek further advice when a worker shows evidence of sensitization to isocyanates, section 4(3)(b) of the Code has been reworded as follows:

"4(3)(b) If the worker shows evidence of reaction to isocyanates, the examining physician shall refer the worker for further assessment. On receiving the report of the further assessment the examining physician shall advise the employer and the worker as provided for in Section 17 of the Regulation."

The key feature of these provisions is that in important situations such as those suggested by Council, the worker must be referred for further investigation. However, Ministry officials do not believe that it is necessary or practical to mandate the involvement of a medical specialist in all such cases. Where removal from or return to work is being considered, it is clear that the examining physician must make the decision, as he is most familiar with the working conditions.

On a related point, the Council questions the wording of section 4(3)(a) relating to the interval over which the 15% decline in pulmonary function parameters must be measured. Ministry officials clearly believe that a drop of 15% in FEV_1, in the time between two periodic tests, is a cause for concern. However, there is also the concern that cumulative declines, each one less than the 15% action level, could lead, over a longer period of time, to a loss of function substantially greater than 15%. Therefore, it is important to compare pulmonary function test results obtained at a periodic examination, not only with results of the previous periodic test, but also with earlier test results back to and including the preplacement examination.

In order to further clarify this section the term "FVC" has been added as a pulmonary function to be monitored. The section will now read:

"4(3)(a) If the pulmonary function tests show a 15% decline in FEV_1, FVC or other significant change from the preplacement or previous periodic test, and this is confirmed, the worker shall be referred for further investigation and his suitability for exposure to isocyanates shall be reviewed."

5. The use of the term "notwithstanding" in subsection 4(2) of the regulation

Task Force members questioned the use of the term "notwithstanding" in section 4(2) of the regulation, pointing out that the phrase "in complying with" had been used in some earlier designated substance regulations. In the advisory memorandum, Council indicates its understanding of the distinction being made, but notes that the wording judged to be less preferable is contained in earlier regulations.

The term "notwithstanding" is preferred to "in complying with" because it more clearly establishes distinct duties. It is not felt that amendments to the regulations for lead and vinyl chloride are necessary at this time.

6. The requirement that respirators be used when workers are exposed to polymeric isocyanates

In discussing the use of respiratory equipment to control the exposure of workers to isocyanates, Council notes that in the case of monomeric isocyanates the onus under subsection 4(6) falls on the employer to prove that the adoption of engineering controls is neither reasonable nor practical. On the other hand, under section 5 which governs polymeric isocyanates, Council suggests that the onus would be reversed, that in the case of a prosecution the Ministry would be required to prove that the engineering controls which an employer ought to have adopted were reasonable and practical. Council wondered whether it is appropriate that the onus of proof be made to fall on different parties, depending on the nature of the isocyanate to which a worker is exposed.

The burden of proof in a provincial prosecution is on the prosecutor for all of the elements of the offence. The burden shifts to the defendant only where there is an authorization, exception, exemption or qualification prescribed by law which operates in favour of the defendant. Subsection 4(6) is an exception to the strict duty imposed by subsections 4(1) and (2). Therefore, the burden is on the defendant to bring himself within subsection 4(6). By contrast, section 5 is a discrete section imposing a general duty on employers to provide engineering controls where it is reasonable or practical to do so. This section is not an authorization, exception, exemption or qualification to any other section and therefore the burden of proving a contravention of this section is on the Crown as it would be under other general duty sections such as S.14(2)(g) of the Act. This result merely reflects basic principles of the common law and the Charter of Rights and Freedoms. It would be unfair to put the burden of proof on the employer where the duty itself is general in nature.

On a related point, Council notes that situations may exist where, owing to the nature of the work operation or the quality of the engineering controls that have been introduced, the use of respirators may not be essential to preserve the health of workers, yet such use would be mandatory under section 5. In fact it is further suggested by Council that the health of some employees might actually deteriorate because of the physical strain associated with respirator use. On this basis Council wonders whether it would not be more appropriate for the proposed regulation to specify that employers must offer respirators to all workers who might become exposed to polymeric isocyanates, and for the Ministry to then determine, on a case by case basis, whether employees must wear these devices.

The difficulty of requiring workers to wear respirators on an ongoing basis, particularly in the case of polymeric isocyanates is acknowledged. As the Council suggests, situations may exist where the use of respiratory equipment may not be essential to preserve the health of workers. However, in the absence of analytical methods to adequately assess the degree of hazard in such situations, it is prudent to require that personal protective equipment be used.

7. The inclusion of a list of basic engineering controls, work practices and hygiene practices in the regulation

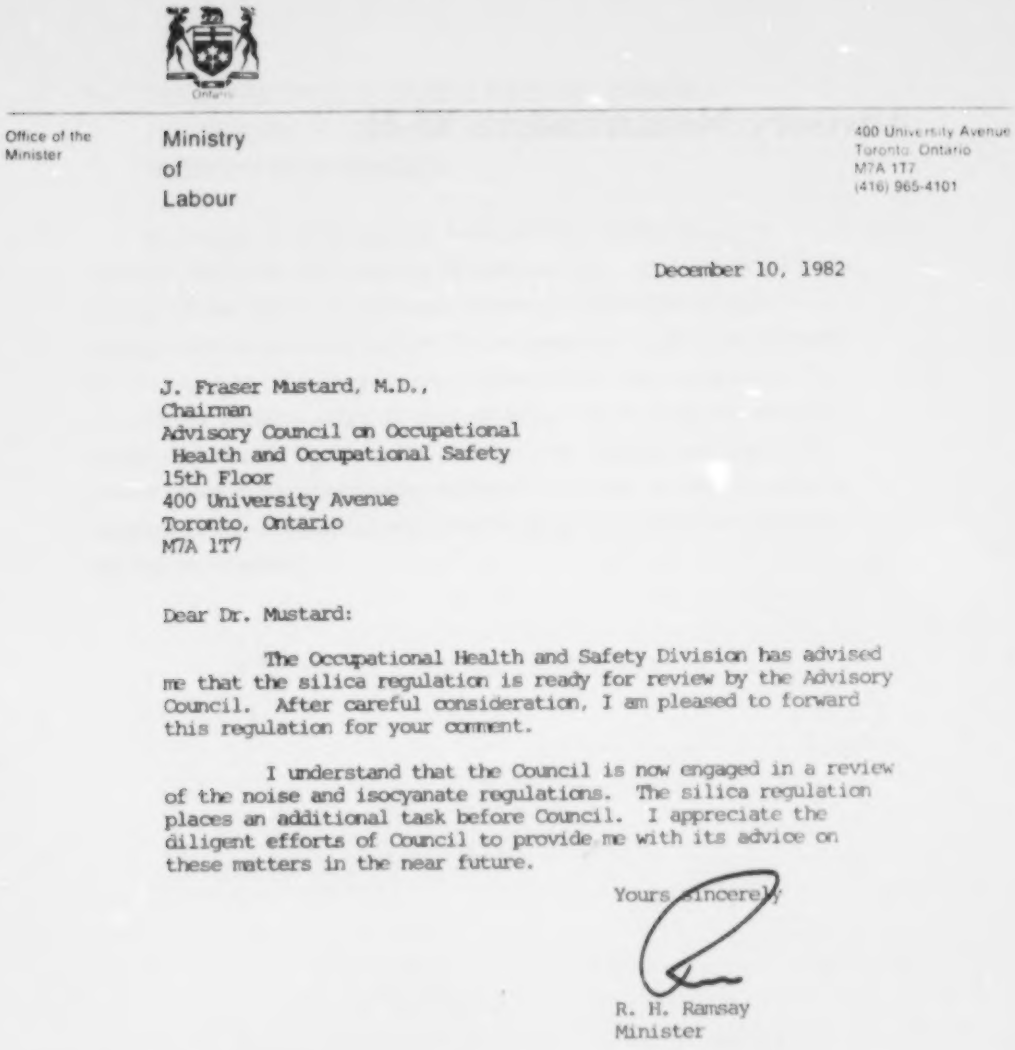
In the advisory memorandum Council re-emphasizes its belief that occupational health regulations should adhere, wherever practicable, to the general principle that exposures should be reduced through the use of engineering controls. In the case of polymeric isocyanates, Council wonders whether this objective could be achieved by placing in the proposed regulation (or in an accompanying schedule) a list of basic engineering controls, work practices and hygiene practices which, if incorporated, would reduce the likelihood of worker exposure to elevated concentrations of these compounds.

Ministry officials share the belief expressed by Council that engineering controls, where practicable, are the most desirable means of reducing the exposure of workers to hazardous agents, and the regulation reflects this philosophy. However, polymeric isocyanates are used in a wide variety of processes. The engineering controls, work practices and hygiene practices available to control the exposure of workers to isocyanates in such circumstances are also varied. A schedule of such controls was included in the coke oven emissions regulation because of the relatively uniform nature of the industry and the limited number of control measures available. Such is not the case in industries using polymeric isocyanates, and therefore, a list of such measures is not feasible.

8. The distribution of information concerning acceptable administrative arrangements for storage of and access to, exposure records of workers

In discussions with the Task Force on Regulations, Ministry officials indicated that a variety of administrative arrangements for the storage of and access to exposure records of workers (including arrangements referred to by Task Force Members) would be acceptable for the purposes of the regulation. Council found the explanation provided by Ministry officials to be sensible. Council suggests that it would be desirable for this interpretation to be distributed to all work places where designated substances are in use. This information will be included in the explanatory material for designated substances which is nearing completion.

Advisory Memorandum 83-II



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December 10, 1982

J. Fraser Mustard, M.D.,
Chairman
Advisory Council on Occupational
Health and Occupational Safety
15th Floor
400 University Avenue
Toronto, Ontario
M7A 1T7

Dear Dr. Mustard:

The Occupational Health and Safety Division has advised me that the silica regulation is ready for review by the Advisory Council. After careful consideration, I am pleased to forward this regulation for your comment.

I understand that the Council is now engaged in a review of the noise and isocyanate regulations. The silica regulation places an additional task before Council. I appreciate the diligent efforts of Council to provide me with its advice on these matters in the near future.

Yours sincerely

R. H. Ramsay
Minister

Ontario

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September 7, 1983

The Honourable Russell H. Ramsay
Minister of Labour
400 University Avenue
14th Floor
Toronto, Ontario
M7A 1T7

Dear Mr. Minister:

On behalf of the Advisory Council, I am enclosing Advisory Memorandum 83-II in which council has reviewed the process for the development of the silica regulation, in light of the policies and principles set out in Advisory Memorandum 78-II.

I trust that the advice provided will prove useful to you.

Yours truly,

J. F. Mustard, M.D.
Chairman

Enc.

c.c. to: T. E. Armstrong, Q.C.
Dr. A. E. Robinson
Mr. B. Goodman

Advisory Memorandum 83-II
to the Minister of Labour
September 7, 1983

A Review by the Advisory Council of the Process Used to Develop a Standard for Silica and Council's Evaluation of the Criteria Utilized to Assess the Hazard of Exposure to Silica in the Workplace

INTRODUCTION

In February 1978, the advisory council and the then Minister of Labour agreed that council should be given the task of reviewing the principles and procedures used in setting occupational health standards and guidelines in Ontario. In Advisory Memorandum 78-II, council set out a list of the basic principles and procedures that should ideally characterize the policy process in respect to establishing standards, guidelines and codes. In this document, council undertook to review the criteria utilized by the Ministry of Labour to evaluate occupational health hazards and to follow the ministry's standard setting process through to its final form. It was also clearly understood that council would limit its review to the process leading to the development of ministry standards. In its memorandum, council also stated that it would require 30 days to complete its review function. In subsequent correspondence with the minister, it was agreed that, because of public interest in the area, council's review of the standard setting process should be submitted in the form of an advisory memorandum.

In June 1980, the Ministry of Labour published a Notice of Intent to designate silica as a substance 'to which the exposure of a worker is prohibited, regulated, restricted, limited or controlled under the *Occupational Health and Safety Act*'. This was followed, in August 1980, by a notice setting forth the ministry's proposed regulation for silica. The notice invited public comments and stipulated that such comments would be made available for public examination. At the same time, the ministry distributed to interested members of the public, copies of the proposed regulation and two related codes; namely that for respiratory equipment for silica and that for measuring airborne silica. In October 1980, the ministry distributed a document entitled *Interim Report on the Designation of Silica in Ontario*. This document dealt with such topics as the use of silica in Ontario, workplace exposures to silica and the health effects that could arise as a result of such exposures. Each interim report also contained a copy of the proposed regulation and the two attached codes. On July 30, 1981, the ministry held a public meeting to discuss changes that had been made to the August 1980 version of the regulation. A revised version of the proposed regulation and the two codes were distributed at this time, along with an entirely new Code for Medical Surveillance of Silica-Exposed Workers. Invitees were informed that they would have a short period of time to comment on any revisions that had been made to the regulation and codes.

On December 10, 1982, the ministry submitted to the advisory council a revised version of the silica regulation. On March 17, 1983, council received from the ministry a document entitled *The Report on the Designation of Silica in Ontario*. It was at this time that council was in receipt of full documentation with which it could undertake its review. This publication on the designation of silica contained, among other things, a summary of the views expressed by members of the public on the various provisions contained in the first and second drafts of the regulation. The type of action taken by the ministry in response to the submissions made was also outlined. The background materials supplied to council did not contain an analysis of the type of economic impact that Ontario industry would likely experience if the provisions contained in the proposed silica regulation were implemented.

After an initial review of the revised regulation and accompanying background materials, council asked that a meeting be scheduled between its Task Force on Regulations and ministry officials. The objective of this meeting was to permit task force members to explore, in greater depth, the rationale employed by the ministry to arrive at certain policy decisions. At that time, council was completing its review of other proposed designated substances regulations that had been submitted to it earlier. This, along with the problem of setting a date compatible with ministry and task force members' schedules, resulted in some delay. Two meetings took place, one on June 17, 1983 and the second on August 8, 1983. Certain issues raised in the agenda for discussion for the June 17 meeting were held over to be discussed at the August 8 meeting to provide the ministry with time to reflect on certain concerns of the task force and to perhaps make appropriate amendments. The agenda for discussion, which was prepared for these meetings, is reproduced as an appendix to this advisory memorandum.

As was the case in council's review of the process leading to the development of other designated substances regulations, council intends to focus on three aspects of the standard setting process. These are the consultative process (i.e. whether the public was provided with sufficient opportunity to comment upon and participate in the development of the regulation), the analytical process (i.e. whether the ministry assembled, reviewed and analysed the available evidence in a reasonable fashion and whether the conclusions reached were compatible with the evidence) and the legal-technical process (i.e. whether the regulation and codes are internally consistent and whether the intent of the ministry has been translated into clear and unambiguous regulatory provisions).

COUNCIL'S REVIEW OF THE STANDARD SETTING PROCESS FOR SILICA

1. The Consultative Process

To reiterate the comments made in previous advisory memoranda, council wishes to commend the ministry on the steps it has taken to make possible public participation in the standard setting process. Council supports ministry efforts to develop an open process for the setting of standards. Council is also cognizant of the special circumstances that surrounded the publication of the first seven designated substances regulations and the difficulty of adhering strictly to the procedures set out by council in Advisory Memorandum 78-II. In this regard, council notes that the former Minister of Labour undertook, in his reply to Advisory

Memorandum 81-I on lead, to give serious consideration to a number of suggestions made by council to enhance the quality of the consultative process. In previous advisory memoranda in which council has reviewed the process used to develop designated substances regulations, council has pointed to the desirability of gazetting the codes that are appended to the designated substances regulations as a means of improving public notification and enhancing the consultative process. Council now notes that in the gazetting of the latest notices of proposed designated substances regulations (subsequent to that for silica), the codes referenced therein have been published along with the proposed regulations.

2. The Analytical Process

In reviewing the analytical process used to develop a standard for silica, council's role is to judge how effectively the ministry has assembled, reviewed and analyzed the available evidence. In embarking on this task, council has the advantage of examining a complex and difficult process in its final stage. Hence, council is in a position to review not only the arguments put forward by participants, but also the rationale supplied by the ministry for formulating its regulation in a particular fashion in light of the evidence and arguments raised.

As a first step in discharging their responsibilities, members of council's Task Force on Regulations met with ministry officials to seek more complete information on the rationale employed by the ministry to arrive at several important regulatory decisions. The key analytical issues taken up with ministry staff are discussed below.

a) *The Rationale for the Choice of the Time-Weighted Average Exposure Limit Contained in the Proposed Regulation*

In its interim report on the designation of silica in Ontario, the ministry took the position that the 0.10 mg of silica per m^3 of air by volume (mg/m^3) TWAEL (the current ministry guideline for silica exposure in Ontario mines and mining establishments) should not be changed until such time as the results of an epidemiological study, to be conducted by Dr. David Muir, were received. On the basis of this earlier statement, the task force asked the ministry to explain why it now believes that the TWAEL should be adjusted upwards before Dr. Muir's study results have been analysed.

In the agenda for discussion with ministry officials, the task force had also noted that the report of Dr. Joan McEwan had contained a recommendation to the effect that a TWAEL of 0.05 mg/m^3 should be established for quartz, crystabolite, tridymite and silica flour.

The ministry pointed out that Dr. Muir and other scientific experts carefully analysed the earlier studies on silica, upon which the guideline of 0.10 mg/m^3 was based. It was their opinion that the number of methodological errors in these earlier studies was such that it could not be accurately determined what a safe level of silica exposure would be. The ministry did feel, however, that the evidence of the studies was sufficient to support a level of 0.20 mg/m^3 as a safe legal standard. The ministry indicated that they felt committed to codifying a standard as soon as possible so that workers would, in fact, be protected.

b) *The Relative Risk of Contracting Silicosis at the 0.10 mg/m^3 and 0.20 mg/m^3 Time-Weighted Average Exposure Levels*

The task force asked the ministry to indicate the evidence upon which it relied for proposing that the relative risk of contracting silicosis will not increase when the TWAEL of 0.10 mg/m^3 is raised to 0.20 mg/m^3.

The ministry's response to this query relates to the preceding issue. The experts within the ministry were not satisfied with the data currently available with which to assess the effects of silica exposure. They do feel that the scientific evidence does not suggest that an exposure level of 0.20 mg/m^3 in combination with the duty to reduce exposure to the lowest practical level presents significant risk to workers. Rather, they contend that the safe level is within a range of exposure levels between 0.10 mg/m^3 and 0.20 mg/m^3. The ministry emphasizes that the regulation is intended to keep silica exposures at 'the lowest practical level' which, in many cases, will be 0.10 mg/m^3 or lower. Despite the paucity of accurate data, the ministry indicated that it did use the findings by Russell,[1] which indicated that no new cases of silicosis were reported where silica levels were reduced to 0.20 mg/m^3 or less.

c) *The Duty to Reduce Silica Exposures to the Lowest Practical Level*

Among issues raised by the task force for discussion with ministry officials, was the concern that, in spite of the obligation on the employer to reduce the time-weighted average exposure of a worker to airborne silica to the lowest practical level (sub-section 4(1) of the proposed regulation) by imposing a maximum limit of 0.20 mg/m^3, industries that were keeping levels at 0.10 mg/m^3 or lower might, in some cases, allow exposure levels to rise. The task force asked the ministry to elaborate on the steps it would take to ensure that employers who were controlling exposure levels at below the proposed TWAEL would continue to do so once the silica regulation is promulgated.

With respect to this issue, the ministry indicated in a letter of August 4, 1983 to council (Appendix B) that as a result of the points raised in the Agenda for Discussion and in meetings held within the ministry that sub-section 4(1) of the proposed regulation had been amended. The wording of said sub-section had been amended to read as follows:

> 'Every employer shall take all necessary measures and procedures by means of engineering controls, work practices and hygiene practices and facilities to ensure that the time-weighted average exposure of a worker to airborne silica is reduced to the lowest practical level *with a view to achieving at least 0.10 mg of silica per m^3 of air by volume* and in any event shall not exceed 0.20 mg/m^3.'

The ministry indicated that the addition of the phrase 'with a view to achieving at least 0.10 mg of silica per m^3 of air by volume', strengthens the effect of the obligation already existent in the section. The ministry felt that the said phrase effectively precludes an employer from relaxing his efforts to minimize silica levels.

A further provision that was added to the proposed regulation, as noted in the above-mentioned letter of August 4, 1983, dealt with the use of respiratory equipment. Sub-section 5(2) was added specifying that:

> 'Where a worker is exposed to a time-weighted average of airborne silica of 0.20 mg per m^3 of air by volume or less, the worker may request a respirator and the employer shall provide it.'

This addition, the ministry explained, would make it easier to ensure that respirators were, in fact, worn properly, since it would now be a violation of the regulation itself not to do so.

d) *The Scope of the Ministry of Labour's Proposed Epidemiological Study of the Health Effects of Silica Exposure*

During their meeting with ministry officials, task force members wished to know whether the proposed epidemiological study that the ministry plans to sponsor will consider the possibility that exposure to silica may directly or indirectly contribute to the incidence of cancer.

Dr. D. Muir, of McMaster University, is in charge of the proposed epidemiological study. He pointed out that a recent study conducted by Dr. Muller[2] demonstrated an increased incidence of respiratory cancer among workers exposed to silica. The research team will endeavour to study the lungs of deceased miners to assess dust content and the presence of carcinomas and will endeavour to determine which exposures in underground mines could be responsible for an increased incidence of respiratory cancer.

e) *The Interim Nature of the Exposure Limit Contained in the Proposed Regulation*

The task force requested from the ministry clarification on the issue of whether the proposed regulation should be regarded as an interim standard for which the TWAEL exposure limit of 0.20 mg/m^3 level will be reconsidered within a defined period of time.

The ministry emphasized that all regulations are open to review should new evidence become available and that the regulation should definitely not be viewed as an 'interim measure'. The regulation will be the law at that time and will remain the law until some new findings suggest that amendments would be appropriate. The ministry noted, however, that the Muir study could prompt a review of the standard when it is completed in three years.

f) *The Exposure Levels Currently Being Achieved in Silica Work Sites*

The ministry provided the task force with background materials indicating exposure levels for silica being attained in the jurisdiction. The information presented to the task force based on samples taken in mining work sites indicates (as sampled) nine per cent controlling exposures at levels above 0.20 mg/m^3, 16 per cent operating at levels between 0.20 mg/m^3 and 0.10 mg/m^3, and 75 per cent achieving silica exposure levels below 0.10 mg/m^3. In order to assess the significance of these data more accurately, task force members sought clarification as to:

i) the class of mines (e.g. underground or surface operations) to which these figures relate.
ii) whether the figures provided relate to time-weighted averages or maximum exposures.
iii) whether the data obtained is the product of a systematic survey or simply the result of routine monitoring.
iv) the type of sampling strategy employed to obtain these figures (i.e. area or personal monitoring).
v) whether comparable data are available for other industries where workers may be exposed to silica.

The ministry indicated that the summary of sampling results (Appendix C) included gold mines, uranium mines, iron mines, base metal mines and nickel mines. Ninety-five per cent of the samples were taken from underground portions of the mines, while five per cent were taken on the surface.

The ministry further explained that the figures provided in the survey were the result of time-weighted average exposure levels (TWAELs) and not maximum exposure limits. The TWAELs were based on an eight-hour sample and the ministry felt that the results would be similar had the sampling period been extended over 40 hours.

The results obtained were the product of routine monitoring as opposed to a systematic survey. The ministry stated that production workers are monitored more frequently than support workers, and areas with potentially high concentrations of silica dust are ordinarily given a higher weighting when samples are taken.

Ninety-five per cent of the samples taken were based on personal, as opposed to area, monitoring strategies. Gravimetric techniques were employed throughout the survey.

The task force wished to know what percentage of miners would be exposed to which exposure levels. The ministry stated that there was information on the number of workers employed in each mine, but data were not available that would show the numbers of workers exposed to the various levels.

The ministry provided task force members with a table indicating the silica levels in a sample of non-mining industries. These data were compiled from ministry records of air samples taken in the period June 1979 - May 1983 in 103 industrial work sites. A summary of the results is reproduced in Appendix D. Those figures indicate that 23 per cent of companies surveyed have silica levels greater than 0.20 mg/m^3 (as opposed to nine per cent in mining industries).

The task force asked the ministry what the implications were of the above findings.

In reply, the ministry suggested that in certain areas engineering controls might reduce silica exposure levels to 0.20 mg/m^3, but that in some situations this reduction may not be feasible and for some workers the wearing of respirators would be necessary.

The task force questioned the use of respirators as a long-term solution, noting that experience has shown that over longer periods of time workers will not wear respirators. The task force acknowledged that the using of respirators may, at least at this time, be the only feasible way to protect workers in high silica exposure areas.

g) *The Economic and Technological Feasibility of Achieving the Standard Being Established for Silica*

The task force requested elaboration from the ministry with respect to the technological and economic feasibility of a TWAEL of 0.20 mg/m^3 for silica for different classes of Ontario industries.

The ministry stated that, as in the past, they relied heavily on input from industry and labour. They mentioned that briefs from the Ontario Foundry Association and the Ontario mining industry indicated the difficulties in achieving a TWAEL for silica of 0.10 mg/m^3. Several mining companies stated that in certain sectors of the industry, the engineering costs of compliance with a 0.10 mg/m^3 standard would be prohibitive and that in a few operations the engineering control mechanisms were not available. In addition to receiving and analysing the briefs from the mining industry, the ministry asked the Mining Legislative Review Committee, composed of representatives from management, labour and government, to review the proposed standard and the technological/economic feasibility of its implementation. The ministry indicated that this committee recommended a standard higher than 0.10 mg/m^3 TWAEL as an initial objective, with a 0.10 mg/m^3 TWAEL as an ultimate goal. This same committee met at a later date and endorsed a TWAEL of 0.20 mg/m^3 for silica as being a technologically/ economically feasible standard.

Council notes that the ministry has previously described the difficulties inherent in conducting a full economic impact study. Council, however, urges that more attention be paid to improving the quality of the data upon which economic and technological feasibility estimates are made.

h) *Silica Exposures in Underground and Surface Mining*

The task force requested clarification of the ministry's rationale for setting a single exposure limit for both underground and surface mining operations.

The ministry explained that it is, to a certain extent, concerned with the ease of administering the proposed regulation, which would be hindered by imposing non-uniform standards. Also, it is logical to have a single standard for a substance that is known to have a detrimental effect on human health.

i) *Sandblasting*

The task force asked the ministry to indicate its rationale for not prohibiting the use of silica sand in sandblasting activities, noting that the use of silica in sandblasting has been banned in Britain, and several studies have recommended banning it in other jurisdictions. The task force raised the concern that sandblasting is an activity that cannot be adequately dealt with by the use of controls and respiratory equipment. Also, it does not feel that silica levels could be accurately monitored in this activity. In addition, the task force pointed out that there are substitutes for silica sand that can be used in sandblasting, and are, in fact, voluntarily used in this jurisdiction.

The ministry indicated that it does not feel it could justify prohibiting the use of silica sand in sandblasting operations, as it feels that the risks can be avoided through control methods and the use of respiratory equipment. It also indicated that 80 to 90 per cent of that industry are using materials that do not contain silica.

Council notes that the standard setting process has difficulties in effectively dealing with these special circumstances.

3. The Legal-Technical Process

In the meetings of June 17 and August 8, 1983, task force members also raised a number of points relating to the legal-technical aspect of the standard setting process. The key issues discussed with ministry officials are set out below:

a) *Training Programs for Supervisors and Workers Employed in Silica Job Sites*

The task force asked the ministry if it felt that the wording contained in sub-section 14(2)(a) of the *Occupational Health and Safety Act* (viz. '. . . an employer shall provide information, instruction and supervision to a worker to protect the health or safety of the worker') is specific enough to oblige all employers, to whom the regulation applies, to institute a formal training program for supervisors and workers on the health effects of silica.

In responding to this concern, the ministry indicated that there would be a section of the proposed regulation that would require employers to conduct a training program for supervisors and workers on the health effects of silica and the measures and procedures required by the code for dealing with silica dust.

b) *The Specific Components of a Silica Control Program*

The task force was interested to know whether the ministry considered any engineering controls and/or work practices appropriate for all silica control programs.

It is the ministry's opinion that it is not possible to have one silica control program for all types of workplaces. Because silica is present in a number of industries in various crystalline forms and concentrations, one control method might not be effective in all work areas. Also, the size of the silica particle along with the concentration will vary in a single industry in the different operations.

c) *The Medical Removal of a Worker from a Silica-Exposure Environment*

In the meeting of June 17 with ministry officials, the task force expressed some concern that there were no general guidelines in the code to help physicians determine (a) whether a worker is suffering from silicosis, (b) whether further exposure to silica is likely to cause a worker's health to deteriorate, and (c) under what circumstances a worker should be declared unfit to work with silica.

The task force felt that there could be a lack of uniformity in medical reasons for worker removal.

The ministry indicated agreement that examining physicians need some general guidance on the question of worker removal. The ministry intends to provide administrative guidelines with the regulation; however, it does not feel that it would be appropriate to formulate diagnostic guidelines. Prior to worker removal, the examining physician would be required to consult with a senior chest disease consultant of the Ministry of Labour and a rehabilitation officer of the Workers' Compensation Board. The ministry feels that this procedure will result in uniform criteria throughout the jurisdiction with respect to worker removal.

The task force has some concern that the mandatory consultative procedure may not always yield uniform diagnostic criteria in a worker removal situation. The examining physician need not follow the recommendations of the chest disease specialist or the WCB even though such an action could be viewed as professional irresponsibility. The possibility of such actions could undermine the system. It is also felt that the chest disease specialists of the ministry may not always agree on the criteria necessary to remove a worker from a work site. Because of the possibility that a worker may be unfairly removed from his workplace, the task force would like to see an appeal mechanism, preferably within the confines of the regulation, to provide redress for such actions.

The ministry responded to this concern by pointing out that an aggrieved worker could file a claim with the Ontario Human Rights Commission, claiming that he had been discriminated against because of his so-called physical disability.

The task force maintained that it had concerns about workers having to seek clarification about something that should not happen in the first place.

d) *The Right of an Employee Who Has Been Removed From a Silica-Exposure Work Site to Obtain Employment in Another Silica-Exposure Work Site*

During its meeting with ministry officials, the task force posed the following question: Where an employee is removed from a silica-exposure work site as a result of the provisions contained in the proposed regulation, will the worker be precluded from obtaining employment in a different silica-exposure work site (as would be the case under the present miner's certification program)?

In responding to this question, the ministry stated that where an individual is removed from work, this is presumably done for cause. Where the worker seeks employment in a different location, his physicial impairment will most likely be revealed during the pre-employment examination. In this regard, efforts are being made to improve the ability of occupational health physicians to read chest X-rays. In addition to this, it was pointed out that once a worker is declared unfit in a previous workplace and is confirmed to be showing signs of incipient silicosis (code '4') or to be with silicosis without significant impairment (code '5'),[3] the worker can avail himself of the WCB retraining and rehabilitation program.

The task force maintained that the conditions for eligibility for that program were quite restrictive and that a worker may be screened from employment in a pre-employment medical and yet be ineligible for the WCB programs in terms of the radiological criteria as defined by the board.

e) *The Entitlement of an Employee Who Has Been Removed From a Silica-Exposure Environment to Workers' Compensation Benefits*

On a related point, the task force raised the question of whether a worker might be removed from a silica worksite pursuant to section 16(1) of the proposed regulation and may not be entitled to WCB benefits because the board disagrees with the removal decision.

The ministry replied that such an outcome was possible, since the removal decision is the responsibility of a different agent that that charged with the task of compensation.

The task force suggested to the ministry that the WCB criteria used in assessing whether or not to compensate a silicotic worker was confusing to the medical profession and ought to be replaced with the ILO method. It would be expected that this change would help physicians to determine levels of silicosis in a more uniform manner, while keeping in mind the WCB criteria for compensation.

In response, the ministry (while noting, however, that this related to a board function) indicated that the ministry agreed there may well be a need for further discussion to determine whether an alternative method of classification should be used.

f) *The Health Surveillance Procedures Specified in the Code for Medical Surveillance of Silica-Exposed Workers*

During a meeting with ministry officials, the task force requested responses on two questions that relate to the health surveillance procedures set out in section 4 of the code for medical surveillance.

1. How will the ministry determine whether a physician is proficient in reading chest radiographs according to the ILO 1980 code?
2. Why does the ministry believe that a mid-flow rate test, such as the forced expiratory flow (FEF) 25-75 per cent, is relevant to the diagnosis of silicosis?

In response to the first question, the ministry indicated that it is developing a system designed to test proficiency in reading chest X-rays, according to the 1980 ILO code. One object of the exercise will be to enhance the standardization of diagnosis.

Responding to the second question, the ministry stated that it does not believe that the FEF 25-75 per cent test will aid in the diagnosis of silicosis. It is felt, however, that since a forced expiratory curve will be obtained in any event, supplementary and possibly useful data could be obtained through the use of a mid-flow rate test.

The concern of the council is that the FEF 25-75 per cent test (a) is no more sensitive than other pulmonary function tests, (b) is much more variable than other tests (i.e. the forced expiratory volume (FEV) and forced vital capacity (FVC) tests are reproducible within five per cent, while the FEF 25-75 per cent test is reproducible within 25 per cent), and (c) does not decay in a linear fashion. Council remains unsatisfied with respect to the value of pulmonary function tests and is of the view that these tests are questionable values for routine use in the silica medical surveillance program.

g) *Steps to Ensure That Silica Workers Are Not Exposed to Unnecessary X-rays*

Sub-section 4(1) of the Code for Medical Surveillance of Silica Exposed Workers states that 'at a pre-placement screening, to avoid unnecessary X-rays, the examining physician *should* (emphasis added) obtain the medical status from another facility if the worker has been previously examined within the past year.' Task force members asked the ministry to consider substituting the term 'shall where possible' for 'should' in order to oblige the physicians to use their best efforts to obtain recent X-rays.

The ministry agreed with this concern and stated that the term 'should' would be changed to 'shall where practical'.

h) *Amendment Dealing With the Use of Respiratory Equipment*

It has already been noted in the foregoing discussion of the analytical process [2(c)] that the ministry made several amendments to the proposed regulation as described in a letter to council of August 4, 1983. One of these amendments related to a specific regulatory objective that the time-weighted average exposure of a worker to airborne silica be reduced to the lowest practical level with a view to achieving at least 0.10 mg of silica per m^3 of air by volume. A second amendment, with respect to the use of respiratory equipment was also described.

Council feels that the following additional amendment should also be noted. In order to ensure that respiratory equipment be used in accordance with the requirements of the code, a second provision was added to section 5 of the proposed regulation. Sub-section 5(3)(c) states that:

> 'Where respiratory equipment is provided by an employer and used by a worker, the respiratory equipment shall
>
> (c) be used in accordance with the requirements of the Code.'

CONCLUSION

In previous advisory memoranda, council has observed that the development of occupational health regulations is a difficult and complex task, particularly in the context of an open consultative process. In the case of the proposed silica standard, it is clear that the dialogue conducted between the ministry and members of the public has caused important and beneficial changes to be made to the regulation and to the accompanying codes. Council is also highly appreciative of the open attitude adopted by ministry officials with respect to the points raised by its Task Force on Regulations. In council's view, the manner in which the proposed silica regulation has been developed attests to the value of the consultative process as a mechanism for the formulation of more effective occupational health regulations.

Footnotes

1. Russell, A.E., The Health of Workers in Dusty Trades - VII. Restudy of a Group of Granite Workers. Public Health Bulletin No. 269. Federal Security Agency, U.S. Public Health Service, 1941.
2. Muller, J., Wheeler, W.S., Gentleman, J.F., Suranyi, G. Kusiak, R.A., Study of Mortality of Ontario Miners 1955-1977. Ontario Ministry of Labour, Ontario Workers' Compensation Board, Atomic Energy Control Board of Canada. Part I, May 1983.
3. The definition of 'incipient' mineral dust disease relates to radiological change and/or pulmonary function impairment not of a degree to justify a diagnosis of pneumoconiosis, but of such a nature that in others has been known to precede the development of manifest disease (radiological).
   The radiological criteria used to define these two stages of eligibility (code '4' and code '5') are derived from the Ontario X-ray classification used for screening workers in dust since 1937. This classification is a slightly modified version of the South African system of 1930. This system encompasses a numerical listing of gradation of change from one to 27. Code '4' represents 'pre-silicosis' or dust effects and may or may not progress to minimally recognizable pneumoconiosis (code '5').

Acknowledgements

The task force included four members of the Advisory Council on Occupational Health and Occupational Safety and two outside experts. The council members were Mr. L. Heard (chairman), Dr. J. W. Charters, Mr. J. M. More and Mr. M. A. Taschereau. The non-council members chosen to serve on the task force were Dr. D. C. F. Muir and Dr. W. K. C. Morgan.

APPENDIX A

Agenda for Discussion

1) *The Rationale for the Choice of the Time-Weighted Average Exposure Limit Contained in the Proposed Regulation*

   In its Interim Report on the Designation of Silica in Ontario, the ministry took the position that the 0.10 mg/m^3 TWAEL (the current ministry guideline for silica exposure in Ontario mines and mining establishments) should not be changed until such time as the results of an epidemiological study, to be conducted by Dr. David Muir, were received. On the basis of this earlier statement, could the ministry explain why it now believes that the TWAEL should be adjusted upwards *before* Dr. Muir's study results have been analysed.

   On a related point, could ministry officials elaborate on their reasons for not following the recommendation contained in the report of Dr. Joan McEwan to the effect that a TWAEL of 0.05 mg/m^3 should be established for quartz, crystabolite, tridymite and silica flour?

2) *The Relative Risk of Contracting Silicosis at the 0.10 and 0.20 mg/m^3 Time-Weighted Average Exposure Levels*

   Could the ministry set out, for the benefit of task force members, the evidence upon which it relies for the proposition that the relative risk of contracting silicosis will not increase when the TWAEL of 0.10 mg/m^3 is raised to 0.20 mg/m^3?

3) *The Interim Nature of the Exposure Limit Contained in the Proposed Regulation*

   The task force would like to discuss with ministry officials the question of whether the proposed regulation should specify that the 0.20 mg/m^3 exposure limit is to be regarded as an interim standard that will be reconsidered within a defined period of time.

4) *The Duty to Reduce Silica Exposures to the Lowest Practical Level*

   Could the ministry elaborate on the practical steps it will take to ensure that employers who are controlling silica exposures below the proposed TWAEL will not relax their control efforts once the silica regulation is promulgated?

5) *The Scope of the Ministry of Labour's Proposed Epidemiological Study on the Health Effects of Silica Exposure*

   Could the ministry indicate whether the proposed epidemiological study that it plans to sponsor will consider the possible association between exposure to silica and the incidence of lung cancer?

6) *The Exposure Levels Currently Being Achieved in Silica Work Sites*

In its background materials, the ministry provides data on the exposure levels for silica being attained in different mine sites in the jurisdiction. According to these statistics, nine per cent of the mines sampled are controlling exposures at levels above 0.20 mg/m^3, 16 per cent are attaining levels between 0.10 and 0.20 mg/m^3, and 75 per cent are able to achieve exposure levels below 0.10 mg/m^3. In order to grasp the full significance of these data, could the ministry supply task force members with information on:

a) The class of mines (e.g. underground or surface operations) to which these figures relate.
b) Whether the figures provided relate to time-weighted averages or maximum exposures.
c) Whether the data obtained are the product of a systematic survey or simply the results of routine monitoring.
d) The type of sampling strategy employed to obtain these figures (i.e. area or personal monitoring).
e) Whether comparable data are available for other industries where workers may be exposed to silica (e.g. steel-making, ceramics, silica flour production).

7) *The Economic and Technological Feasibility of Achieving the 0.20 and 0.10 mg/m^3 Time-Weighted Average Exposure Limits for Silica*

Could the ministry elaborate on its reasons for believing that a TWAEL of 0.20 mg/m^3 for silica will be both economically and technologically feasible for different classes of Ontario industries? On a related point, could the ministry elaborate on the economic and technological feasibility of achieving a 0.10 mg/m^3 exposure limit?

8) *Silica Exposures in Underground and Surface Mining*

The task force would like to explore the ministry's rationale for setting a single exposure limit for both underground and surface mining operations.

9) *Training Programs for Supervisors and Workers Employed in Silica Job Sites*

The task force would like to discuss with ministry officials the question of whether the wording contained in sub-section 14(2)(a) of the *Occupational Health and Safety Act* (viz. '. . . [A]n employer shall provide information, instruction and supervision to a worker to protect the health or safety of the worker') is specific enough to oblige all employers to whom the silica regulation applies to institute a formal training program for supervisors and workers on the health effects of silica.

10) *The Specific Components of a Silica Control Program*

Could the ministry indicate whether, in its views, there exist any engineering controls and/or work practices that should be incorporated into all silica control programs?

11) *Sandblasting*

The task force would like to explore the ministry's rationale for not prohibiting the use of silica sand in sandblasting activities.

12) *The Medical Removal of a Worker from a Silica-Exposure Environment*

Under sub-section 4(3) of the Code for Medical Surveillance of Silica-Exposed Workers, a physician (once he has determined that a worker is exhibiting signs of silicosis, and after consulting with the Ministry of Labour and the Workers' Compensation Board (WCB)), must determine whether a worker is fit, fit with limitations or unfit for continued work in a silica-exposure environment. The task force would like to discuss with ministry officials the ministry's reasons for not including in the code a series of general guidelines to help physicians determine (a) whether a worker is suffering from silicosis, (b) whether further exposure to silica is likely to cause a worker's health to deteriorate, and (c) under what circumstances a worker should be declared unfit to work with silica.

13) *The Right of an Employee Who Has Been Removed From a Silica-Exposure Work Site to Obtain Employment in Another Silica-Exposure Work Site*

Could the ministry provide task force members with a response to the following question: Where an employee is removed from a silica-exposure work site as a result of the provisions contained in the proposed regulation, will the worker be precluded from obtaining employment in a different silica-exposure work site (as would be the case under the present miners' certification program)?

14) *The Health Surveillance Procedures Specified in the Code for Medical Surveillance of Silica-Exposed Workers*

Members of the task force would like to pose two questions that relate to the health surveillance procedures set out in section 4 of the code for medical surveillance. First, how will the ministry determine whether a physician is proficient in reading chest radiographs according to the ILO 1980 code? Second, why does the ministry believe that a mid-flow rate test, such as the FEF 25-75 per cent, is relevant to the diagnosis of silicosis?

15) *Steps to Ensure That Silica Workers Are Not Exposed to Unnecessary X-rays*

Sub-section 4(1) of the Code for Medical Surveillance of Silica-Exposed Workers states that 'At a pre-placement screening, to avoid unnecessary X-rays, the examining physician *should* [emphasis added] obtain the medical status from another facility if the worker has been previously examined within the past year.' In order to ensure that physicians use their best efforts to obtain recent chest X-rays, task force members wonder whether it would not be more appropriate to substitute the term 'shall where possible' for 'should'.

16) *The Entitlement of an Employee Who Has Been Removed from a Silica-Exposure Environment to Workers' Compensation Benefits*

Could the ministry indicate, from its discussions with the WCB, whether an employee who has been removed from a silica work site pursuant to sub-section 16(1) of the proposed regulation will be entitled to workers' compensation benefits, notwithstanding that the board disagrees with the removal decision?

APPENDIX B

Ontario

Office of the
Deputy Minister

Ministry
of
Labour

400 University Avenue
Toronto, Ontario
M7A 1T7
416/965-4115

August 4, 1983

Dr. J. F. Mustard
Chairman
Advisory Council on Occupational Health
and Occupational Safety
400 University Ave.
15th floor
Toronto, Ontario.

Dear Dr. Mustard:

As a result of the points raised in the Agenda for Discussion prepared by the Advisory Council's Task Force on Regulations, and meetings held within the Ministry, several amendments have been made to the latest draft of the silica regulation.

Sub-section 4(1) of the regulation now provides that:

> "Every employer shall take all necessary measures and procedures by means of engineering controls, work practices and hygiene practices and facilities to ensure that the time-weighted average exposure of a worker to airborne silica is reduced to the lowest practical level with a view to achieving at least 0.10 mg of silica per m^3 of air by volume and in any event shall not exceed 0.20 mg/m^3."

Given that there exists some uncertainty about the health effects that might be induced by exposure to silica at levels of 0.20 mg/m^3 over a working lifetime, and since many employers in the jurisdiction are controlling silica exposures well below this level, it was felt that a specific regulatory objective should be set out. The phrase "at least" has been included to ensure that those employers who have reduced exposure to airborne silica to a level below 0.10 mg/m^3, do not allow levels to increase to 0.10 mg/m^3.

Once the proposed regulation is in place, the Ministry will be monitoring individual work sites to ensure that employers have, indeed, reduced exposures to the lowest practical level. Factors to be considered, in this regard, will include the exposure levels that were previously achieved in the plant or mine, and the levels being met in comparable work places.

... 2

Please note, as well, that two new provisions have been added to Section 5 of the proposed regulation. These provisions deal with the use of respiratory equipment. Sub-section 5(2) specifies that:

> "Where a worker is exposed to a time-weighted average of airborne silica of 0.20 mg per m^3 of air by volume or less, the worker may request a respirator and the employer shall provide it".

A second provision, sub-section 5(3)(c), states that:

> "Where respiratory equipment is provided by an employer and used by a worker, the respiratory equipment shall
>
> (c) be used in accordance with the requirements of the Code."

Ministry representatives would be pleased to discuss these changes with the task force at the meeting scheduled for August 8, 1983.

Yours very truly,

T. E. Armstrong,
Deputy Minister.

APPENDIX C
Mining and Health and Safety Branch
Summary of Sampling Results For Mines—Silica TWAELs

	No. of Samples (n)	*TWAEL = 0.05 mg/m³*		*TWAEL = 0.10 mg/m³*		*TWAEL = 0.20 mg/m³*		
		n ≥ 0.05	*% over*	*n ≥ 0.10*	*% over*	*n ≥ 0.20*	*% over*	*Comments*
Gold	32	5	16	1	3	1	3	Aunor Mine
	47	25	53	8	17	1	2	Campbell Red Lake
	57	20	35	10	18	3	5	Dickenson
	91	56	62	22	24	1	1	Dome
	46	8	17	6	13			Kerr Addison
	45	30	67	21	47	16	36	Pamour #1 Mine
	47	23	49	18	38	13	28	Pamour-Schumacher
	54	13	24	8	15	5	9	Wilaroy-Macassa
Total	419	180	43	94	22	40	10	All Gold Mines
Iron	38	7	18	3	8	2	5	Sherman Mine
	44	33	75	24	55	14	32	Adams Mine
Total	82	40	49	27	33	16	20	Iron Mines
Base Metal	315	178	57	118	37	59	19	Noranda-Geco
	292	172	59	74	25	7	2	Kidd Creek (Texas Gulf)
Total	607	350	58	192	32	66	11	Base Metal Mines
Uranium	275	114	41	46	17	15	5	Denison Mines
	1211	820	68	332	27	99	8	Rio Algom
Total	1486	934	63	378	25	114	8	Uranium Mines
Nickel	196	34	17	11	6	4	2	INCO-Sudbury
Summary	2594	1504	58	691	27	236	9	All Mines Excluding Nickel
	2790	1538	55	702	25	240	9	All Mines

APPENDIX D
Silica Levels in a Sample of Non-Mining Industries

Level of exposure	*# of Companies*	*%*	*Cumulative % of companies below specific limits*
Ceramics/Porcelain Pottery	**10**		
≤ 0.05 mg/m^3	1	10	10
0.05 – 0.10 mg/m^3	4	40	50
0.10 – 0.20 mg/m^3	2	20	70
> 0.20 mg/m^3	3	30	100
Paint/Coatings/Inks	**5**		
≤ 0.05 mg/m^3	1	20	20
0.05 – 0.10 mg/m^3	1	20	40
0.10 – 0.20 mg/m^3	1	20	60
> 0.20 mg/m^3	2	40	100
Clay Brick	**4**		
≤ 0.05 mg/m^3	0	0	0
0.05-0.10 mg/m^3	0	0	0
0.10-0.20 mg/m^3	1	25	25
> 0.20 mg/m^3	3	75	100
Rubber	**4**		
≤ 0.05 mg/m^3	2	50	50
0.05-0.10 mg/m^3	0	0	50
0.10-0.20 mg/m^3	1	25	75
> 0.20 mg/m^3	1	25	100
Sandblasting	**3**		
≤ 0.05 mg/m^3	1	33	33
0.05-0.10 mg/m^3	1	33	67
0.10-0.20 mg/m^3	0	0	67
> 0.20 mg/m^3	1	33	100
Foundries	**25**		
≤ 0.05 mg/m^3	5	25	25
0.05-0.10 mg/m^3	3	7	32
0.10-0.20 mg/m^3	7	28	60
> 0.20 mg/m^3	10	40	100
Concrete/Stone/Cement	**20**		
≤ 0.05 mg/m^3	9	45	45
0.05-0.10 mg/m^3	2	10	55
0.10-0.20 mg/m^3	7	35	90
> 0.20 mg/m^3	2	10	100
General Industry	**32**		
≤ 0.05 mg/m^3	4	13	13
0.05-0.10 mg/m^3	17	53	66
0.10-0.20 mg/m^3	9	28	94
> 0.20 mg/m^3	2	6	100

Summary Results of Air Sampling for Silica, June 1979—May 1983

Level of exposure	*# of Companies*	*%*	*Cumulative % of Companies below*
≤ 0.05 mg/m^3	23	22	22
0.05-0.10 mg/m^3	28	27	50
0.10-0.20 mg/m^3	28	27	77
> 0.20 mg/m^3	24	23	100

Total number of companies = 103

Ontario

Office of the
Minister

Ministry
of
Labour

400 University Avenue
Toronto, Ontario
M7A 1T7
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January 4, 1984

Dr. J. Fraser Mustard
Chairman
Advisory Council on Occupational Health
and Occupational Safety
15th Floor
400 University Avenue
Toronto, Ontario
M7A 1T7

Dear Dr. Mustard:

Thank you for submitting Advisory Memorandum 83-II on the process used to develop the Silica Regulation.

I appreciate Council's supportive comments with regard to the open and consultative process pursued by the Ministry to ensure public participation in the development of designated substance regulations. While I am mindful of the suggestions to improve this process, contained in Advisory Memorandum 81-I on Lead, I understand that Council is currently reviewing the regulation development process and I look forward to receiving the results of its deliberations.

Your memorandum raises a number of issues, especially with respect to the analytical and legal-technical processes followed in developing the Silica Regulation. I have attached the Occupational Health and Safety Division's response to these technical matters.

There is, however, one item upon which I wish to comment. It deals with the suggestion that an appeal process be instituted to address "... the possibility that a worker may be unfairly removed from his workplace ..." under the code of medical surveillance and by the powers granted under Section 16(1). Please be assured that I appreciate Council's concern about this potential problem. However, a provision similar to that contained in the Silica Regulation appears in the Asbestos Regulation and since August of 1982, neither I nor my officials have become aware of any problem which would suggest that workers are being treated unfairly in removal from work under the Asbestos Regulation. Nonetheless the desirability for an appeal system will be considered by my officials in the context of a review of the implementation of the designated substance regulations and the on-going review of Workers' Compensation legislation.

As noted in my reply to you of August 24, 1983, regarding the Isocyanates Regulation, my officials and I will review with the Chairman of the Workers' Compensation Board access to the special rehabilitation systems and programs. This administrative program should ease the transition for some workers from a silica to a non-silica exposed job where this is necessary for the health of the worker.

As Council members are well aware, the Ministry in conjunction with the Workers' Compensation Board and the Mining Industry is funding a study of the epidemiology of silicosis in hard rock miners in Ontario that is being undertaken by Dr. David Muir. The exposure levels set forth in the Silica Regulation will be reviewed upon the completion of Dr. Muir's study in which dose-response relationships are being investigated. My officials continue to keep a watching brief on the scientific evidence pertaining to the exposure values of all substances which have been designated in Ontario. Should important new information become available, consideration will be given to the need to revise a regulation.

Once again I wish to thank Council for its very thorough review of this regulation. For your convenience, I enclose a copy of the Silica Regulation, filed December 9, 1983.

Yours sincerely,

R.H. Ramsay

R.H. Ramsay,
Minister

atts.

COMMENTS OF THE OCCUPATIONAL HEALTH AND SAFETY DIVISION

ON

ADVISORY MEMORANDUM 83 - II

THE DEVELOPMENT OF THE SILICA REGULATION

DECEMBER 22, 1983

Advisory Council Memorandum 83 - II regarding the development of the silica regulation raises a number of points on which comments should be made. These are:

1. the use of respirators where silica levels cannot presently be reduced by engineering controls,

2. the improvement of the economic and technolo[illegible]data upon which estimates of feasibility are made,

3. the addition of a subsection on providing information, instruction and supervision to a worker to protect the health and safety of the worker,

4. the use of silica sand in sand blasting,

5. the provision of administrative guidelines for physicians,

6. the possibility of an alternative method of classification to replace current WCB criteria for removal, and

7. the pulmonary function studies currently specified in the Code for Medical Surveillance.

These issues will be responded to in order.

1. The use of respirators where silica levels cannot presently be reduced by engineering controls.

   The task force has questioned the acceptance of the use of respirators as a long-term solution where engineering controls are not presently feasible to reduce worker exposure to 0.2 mg silica per cubic metre of air. In such situations where current technology does not provide a solution, respirators are a necessary, if not particularly desirable, alternative. The Council task force acknowledged that at this time, this is "...the only feasible way to protect workers in high silica exposure areas".

2. The improvement of the economic and technological data upon which estimates of feasibility are made.

Council notes that the Ministry has previously described the difficulties inherent in conducting economic impact studies. Council urges, however, that more attention be paid to improving the quality of the data upon which economic and technical feasibility estimates are made.

The substance of previous Ministry responses on this point is that the exposure values chosen are based on health effects. Preliminary information has been collected on the technological and economic feasibility of implementing the regulation prior to publication of the regulation but, as Council notes, the Ministry relies heavily on input from industry and labour to determine whether the values selected are feasible for Ontario industry. The quality of the data is therefore dependent on the information provided by the parties affected. Difficulties have arisen in the past where industry has been reluctant to provide details both as to the cost of specific requirements of the regulations or as to the impact the regulation will have on the position of the industry vis-a-vis industries in other jurisdictions. With respect to silica the mining industry did provide some figures after the publication of the proposed regulation which permitted the Ministry to obtain a clearer idea of the economic impact of the regulation, particularly with respect to the proposed exposure value. In the proposed regulations for designated substances published in 1983, some of the previous difficulties will be alleviated by the reports prepared by consultants prior to the development of the proposed regulation. The input of the specific industries affected, with detailed information, will still be an integral component in the determination of both the economic and technical feasibility of any regulatory action. However, the Division would welcome any advice the Council could provide on this matter from its Task Force on the Interpretation of Health Effects Data and the Role of Economic Analysis in the Standard - Setting Process.

3. The provision of a requirement for a training program for supervisors and workers.

At the meeting with Council the Ministry indicated that a subsection would be added to the proposed regulation requiring employers to conduct a training program for supervisors and workers on the health effects of silica. The following subsection 7(2)(g) has been added to the regulation.

> "7(2)(g) a training program for supervisors and workers on the health effects of silica and the measures and procedures required under the silica control program."

4. The use of silica sand in sand blasting.

The Council raised the issue of prohibiting the use of silica sand in sand blasting activities, noting that this process had been banned in Britain and several studies had recommended banning it in other jurisdictions. The Task Force is concerned that sand blasting is an activity that cannot be adequately dealt with by the use of engineering or administrative controls and respiratory protection.

Sand blasting is an activity which is principally carried out in the construction industry. The construction regulations, when developed, will review thoroughly the health effects from sand blasting with silica. If, at that time, the hazard is deemed sufficient to warrant the prohibition of sand blasting operations, the Ministry will consider proposing such a course of action and will review whether the silica regulation should be revised as well.

5. The provision of administrative guidelines for physicians.

Council notes that at the meetings to discuss the silica regulation, the Ministry indicated that examining physicians need some general guidance on the question of worker removal. Officials had indicated that prior to worker removal the examining physician would be required to consult with the senior chest disease consultant and a rehabilitation officer of the Workers' Compensation Board. To ensure that examining physicians are aware of the procedure, administrative guidelines are being prepared which can be sent to all physicians examining for silicosis.

6. The possibility of an alternative method of classification to replace current Workers' Compensation Board criteria for removal.

The Council has suggested to the Ministry that the Board criteria used in assessing whether or not to compensate silicotic workers is confusing to the medical profession and ought to be replaced with the method recommended by the ILO.

Since meeting with Council the Ministry has commenced using the ILO classfications and these are being computerized with the classification used by the Board. Ministry officials will consider this issue with W.C.B. officials in the context of the forthcoming Report of the Royal Commission on Asbestos.

7. The pulmonary function studies currently specified in the Code for Medical Surveillance.

The question of the inclusion of the FEF 25-75 percent test was raised by Council. The principle concerns with this test as expressed by the Task Force were the lack of reproducibility, the limited sensitivity and the lack of linearity when compared with other pulmonary function tests. The view of the medical staff of the Ministry is that the test, although not diagnostic of silicosis, may have some use in the evaluation of pulmonary function and can be calculated from the charts obtained for the FEV_1 and FVC without any additional testing of the worker.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Advisory Memorandum 83-III

Ontario

Advisory Council on
Occupational Health &
Occupational Safety

Office
of the
Chairman

400 University Avenue
Toronto, Ontario
M7A 1T7
416/965-2448

December 16, 1983

The Honourable R.H. Ramsay,
Minister of Labour,
400 University Avenue, 14th Floor,
TORONTO, Ontario.

Dear Mr. Minister:

On behalf of the Advisory Council, I am pleased to submit Advisory Memorandum 83-III in which council has reviewed the role of the physician in health surveillance.

This memorandum represents part of a broader study on health surveillance, health screening and biological monitoring in the workplace which will be submitted by council at a later date.

Yours truly,

J. F. Mustard
Chairman

Encl.

cc to: T. E. Armstrong, Q.C.
Dr. A. E. Robinson
Mr. Brian Goodman

Advisory Memorandum 83-III to the Minister of Labour

December 16, 1983

Health Surveillance and Health Screening in Occupational Health Programs: The Physician in Health Surveillance

INTRODUCTION

In our society, it has traditionally been the individual, rather than a third party, who selects a physician for the diagnosis of symptomatic illness, treatment, and the provision of medical advice. By contrast, matters of public health and environmental protection have typically been overseen by government agencies. Where physicians have been required to carry out aspects of public health programs, they have customarily been selected by government bodies, and not by individuals. Most of the occupational health programs that have evolved in Ontario incorporate elements of both individual medicine (characterized by the doctor-patient relationship) and public health. In many industries, physicians are employed by the industry to fulfil a variety of complex roles in occupational medicine, and there is debate about how these physicians should be chosen. Should, for example, the choice be the exclusive prerogative of the employer or should employees who participate in a health surveillance program also participate in the selection process? This advisory memorandum examines the anomolies that result from having individual and public medicine practised in an occupational setting and comments on the interests to be balanced in the selection of physicians for work-related health programs.

THE LEGISLATIVE FRAMEWORK

There are a number of provisions set out in the *Occupational Health and Safety Act* (hereinafter referred to as the Act) and the designated substances regulations made thereunder that bear on the issue of physician selection. Pursuant to subsections 15(1)(a) and (f) of the Act, an employer is required to establish an occupational health service and to monitor the levels of biological, chemical and physical agents in a workplace as prescribed by regulation. Although these provisions do not specify that a plant physician* must be appointed, it is unlikely that the duties contemplated under the Act could be adequately fulfilled in most industries without the supervision of a medical practitioner. Subsection 17(1)(e) of the Act is also relevant. This provision requires a worker, where prescribed, to undergo, at the expense of the employer, such examinations and tests, at such time or times and at such place, as prescribed. This subsection does not require that the worker be examined by a particular physician who is satisfactory to management. As a practical matter, however, the employer will ordinarily select the physician who will supervise the program of health surveillance in a workplace.

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* 'Plant physician', as used throughout this advisory memorandum, means any physician who has responsibility for a workplace health surveillance program, including those physicians who may be responsible for a number of plants or workplaces.

Several of the provisions contained in the designated substances regulations also merit attention. Under subsection 7(1) of the Regulation respecting Lead,* for example, an employer to whom the regulation applies is required to establish a lead control program for those workers whose health may be affected by exposure to the substance. The control program is to include, among other things, provisions for the medical examination and testing of workers. Subsection 7(3) of the regulation specifies that, in developing the methods and procedures for a control program, the employer must consult with the worksite joint health and safety committee. Although the regulation does not make the point expressly, it would appear that one matter that could be resolved through such consultations is the choice of a physician to supervise the workplace health surveillance program. The final provision of interest is subsection 13(1), which states that a worker is required to undergo, at the expense of the employer, the medical procedures specified under the lead control program. This provision, like subsection 17(1)(e) of the Act, does not prescribe that workers must be examined and tested by a management appointed physician.

THE ROLE OF THE PHYSICIAN

In occupational health surveillance, the term 'physician' is usually synonymous with 'plant physician'. Plant physicians are typically selected exclusively by management, who may retain general practitioners from the community to provide in-plant medical services on a part-time basis or, as is often the case involving worksites with large employee populations and/or the presence of serious occupational hazards, engage a physician as a full-time company employee.

As has already been noted, the Act does not specify that a worker who participates in a designated health surveillance program must be examined by a physician retained by the employer; the worker retains the right to consult a physician of his or her own choice. It has been argued that an individual's decision to be examined by the physician of his or her choice is a fundamental common-law right and one that should not be abridged except under the most compelling circumstances.**

Thus, the situation can commonly arise in which the examining physician and the plant physician are not the same person. Workers may choose to consult their own physicians for a number of reasons, including the following:

- They prefer to be examined by someone who is familiar with their total medical history and with whom they feel comfortable;
- They may feel that their own physician will be less biased in favour of their employer.
- They may feel that if they consult a plant physician, their medical records will not remain confidential. Although the examining physician

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* The general structure of the lead regulation resembles that of the other designated substances regulations that have been enacted to date.

** One situation in which this right might be forfeited is under section 7 of the Lead Regulation. The ministry's Legal Branch has interpreted this provision to hold that in a case in which the joint health and safety committee has made recommendations with respect to the appointment of a physician to supervise a lead control program, workers will be obliged to consult this physician on work-related health matters.[1]

is under a legal duty not to give or disclose the records or results of examinations or tests to the employer or to any other person without the permission of the patient, many workers feel that their records may not remain confidential if kept on company premises.

It has also been argued that where a worker is given the right to select his or her own physician for surveillance purposes, that worker may have more confidence in the quality of the occupational health program in which he or she is asked to participate. As a result, the worker may be more inclined to provide information on signs and symptoms that could be linked to an occupational disease.

There are, however, a number of major disadvantages to a system that recognizes the individual worker's right to choose a physician. These include:

- Family physicians (the group of medical practitioners most likely to conduct health surveillance procedures for workers who do not wish to be examined by plant physicians) may not be possessed of sufficient overall expertise in occupational medicine to know, in all circumstances, whether an individual has been adversely affected by workplace exposures or whether the worker is fit or unfit to undertake certain types of job assignments. Furthermore, the family physician may not be familiar with the occupational hazards encountered in the worker's plant.
- Where a number of physicians are responsible for testing individual workers in a plant, the storage of medical records could become highly decentralized. In this respect, some test and examination results could be lost, thereby prejudicing any future epidemiological studies and rendering government audit activities more difficult.
- Where many physicians are involved with health surveillance procedures in the workplace, there is the risk that identification of unusual findings in a group (e.g. a clustering of abnormal findings among workers employed in a particular operation) could be lost. As a result, it may take more time to identify a problem and mount collective efforts to protect employees at risk.
- Should laboratory biological monitoring procedures be conducted in a myriad different laboratories, it can be difficult, without suitable standardization procedures, to compare the test results obtained for different workers.

Council recognizes, therefore, that serious administrative difficulties could arise when health surveillance procedures are carried out by a multitude of different physicians. Having considered the various viewpoints, however, members have come to the conclusion that the possible drawbacks of having a health surveillance program conducted by a number of physicians do not outweigh the benefits of preserving the individual's traditional right to be examined by a physician of his or her choice. It should be noted, on the other hand, that there may exist circumstances where the worker's right to select his or her own physician will have to give way to more compelling interests. For example, where an employee's state of health might jeopardize the well-being of fellow workers or members of the general population (thereby creating a public health risk), it might be reasonable to insist that the worker be examined by a medical specialist appointed by the government. It should also be noted that most labour arbitration decisions have upheld the right of a management-appointed physician to examine a worker when the employee returns to work after an accident or illness, provided that the relevant collective bargaining agreement covers this particular issue. In general, the physician must be satisfied that the worker's health status will not pose a threat to that worker or to other employees at the job site. Where the worker disagrees with the physician's assessment, he or she is entitled to seek a second medical opinion. In the event that the physicians are unable to reach a consensus on the question of fitness for work, the matter may be resolved through arbitration.

On the basis of the considerations outlined in this section, council makes the following recommendation:

ACOHOS RECOMMENDATION 83-1

> that the Minister of Labour encourage the principle that, except where public health interests could be jeopardized, a worker who is required to undergo health surveillance in the workplace, whether prescribed by regulation or not, is entitled to be examined or tested by the physician of his or her choice.

In a situation where a large number of employees decide that they wish to consult medical practitioners other than the plant physician, the potential problems associated with a lack of uniformity in clinical examination and decentralization of medical records should be addressed. The problems might be overcome by identification of a 'co-ordinating physician', who could provide a linkage between the examining physicians and the workplace records and encourage a standardized approach among the various examining physicians and ensure maintenance of the records. Such a person could be a full-time plant physician employed by the company, a physician in the community appointed by the company as a part-time plant physician, a physician selected by a joint labour/management selection process or a physician appointed by the government. It is not possible, given the complexity of the modern industrial scene, to formulate a single definition of a co-ordinating physician's role or selection, but only to set out the broad principles.

ACOHOS RECOMMENDATION 83-2

> that the Minister of Labour encourage the principle that, with respect to a given employer, in the event that a sizeable number of workers decide that they with to consult a number of medical practitioners other than a designated physician or physician group, a 'co-ordinating physician' should be identified. The co-ordinating physician would be responsible for ensuring both the appropriate standardization of medical examinations and procedures and the adequacy and maintenance of confidential medical records. He or she would also interpret examination and test results, an arrangement that would preserve the worker's freedom of choice and, at the same time, ensure that all results are reviewed by one qualified physician.

Under the present wording of the legislation, the responsibility for ensuring the health surveillance program is in place rests with the employer. The employer has the responsibility to ensure that the terms of the medical surveillance program are met. Thus, under the current arrangements and legislation, although a variety of mechanisms could be used to select and appoint a co-ordinating physician, the employer would have to see that this is done and pay for the services provided. Since complex industries working with hazardous substances will need physicians knowledgeable in the area to give professional advice on their health surveillance programs and to assist in the administration of these programs, the role of the co-ordinating physician should not necessarily be considered the same as that of a plant physician.

SELECTION OF PLANT PHYSICIANS WITH RESPONSIBILITY FOR HEALTH SURVEILLANCE

Despite a worker's fundamental right to consult a physician of his or her choice, it can be anticipated that many workers will still choose to consult the plant physician on work-related health matters. In addition, as has been outlined above, there will be situations in which a worker may be required to be examined by the plant physician. On the basis that some parties disagree in principle with the present *de facto* arrangement for the selection of plant physicians, i.e. by the employer, it may be useful to list the advantages and disadvantages of a) this approach, and b) alternative arrangements for the appointment of such medical practitioners. The four administrative options to be considered involve the choice of a physician by:

a) labour exclusively,
b) management exclusively,
c) a joint labour/management selection process,
d) an independent body (such as a government agency or a medical advisory service).

It should be noted that each of these approaches could be adopted in theory on the basis of the present wording of the legislation.

During its deliberations, the Task Force on Health Surveillance, Health Screening and Biological Monitoring in Occupational Health Programs sought the opinions of various individuals and organizations on the advantages and disadvantages of the four approaches listed. For the sake of convenience, these views are summarized in Appendix A.

Although there is reasonable consensus throughout the industrialized world on the desirability of establishing occupational health programs in the workplace, there is no consensus on the precise role for labour and management in the appointment of plant physicians. It has been argued that, since workers are the individuals most likely to be exposed to health risks in the workplace, they alone should have the right to choose their examining physicians. Any management participation in this process, it is argued, would be wrong in principle. Advocates of this approach point out that when physicians are selected and paid by employers, subtle influences may be brought to bear that could induce these individuals to act against the best interests of workers. They contend further that, since occupational medicine is an amalgam of both science and value judgements, it is important that the physicians who examine and test employees have the preservation of worker health as their primary role. It is also pointed out that, since the interests of labour and management, with respect to occupational health and safety, will often conflict, one physician cannot properly serve the needs of both groups.

A second view put forward is that the stipulation of a single model for the appointment of plant physicians would restrict the ability of labour and management to adopt varied administrative frameworks for the delivery of health surveillance programs. As a result, individual programs would not be able to evolve along their own lines, and the existence of voluntary programs that have developed over time would be jeopardized. It is argued, on this basis, that the present, flexible legislative framework should be retained.

One approach that would allow labour participation while retaining a considerable degree of flexibility would be to utilize the principle of joint labour-management participation in the selection of plant physicians. An approach of this nature, it is suggested, would provide workers with a legitimate input into the appointment process and, at the same time, permit management to have the advice it requires to maintain a healthy working environment. This type of arrangement would embody the theme of joint labour-management responsibility for health and safety matters, as advocated in the report of the Ham Commission.[2]

Such an arrangement is, to some extent, contemplated by section 7(3) of the Lead Regulation, which obliges an employer to consult with the joint health and safety committee in developing the measures and procedures to be included in the lead control program. Among the matters about which the committee may make recommendations is the selection of physician or physicians who will conduct medical examinations and clinical tests. Any dispute that may occur in relation to this selection is to be resolved by a ministry inspector pursuant to section 9(1).

Accordingly, the advisory council makes the following recommendation:

ACOHOS RECOMMENDATION 83-3

> that the Minister of Labour encourage discussions between management and labour representatives in those worksites where there exist both mandatory and/or employer sponsored health surveillance programs, with a view to encouraging the parties to create joint arrangements for the appointment of plant physicians.

In formulating this recommendation, it is not council's intention to infringe upon management's right to appoint physicians for advisory or administrative purposes. Furthermore, should labour and management in a worksite so agree, the employer appointed physician could also be chosen to carry out or supervise health surveillance procedures.

Should the developments under ACOHOS Recommendation 83-3 lead to the establishment in some industries of mechanisms satisfactory to labour and management for the appointment of physicians responsible for health surveillance programs, the ministry may wish to consider broadening the application by taking the appropriate legislative steps to provide for the appointment of physicians who supervise programs of health surveillance in the workplace by a joint labour/management consultation process. Council felt, however, that because of the complexity of this issue, it should be considered at a later date by the Task Force on the Implementation of the *Occupational Health and Safety Act*, rather than in the current context.

THE ISSUE OF PHYSICIAN COMPETENCE

In the view of council members, it is essential that the physicians chosen to administer health surveillance programs in the workplace have some expertise in the field of occupational medicine. In Advisory Memorandum 80-I on manpower planning,[3] the advisory council suggested that two steps be taken to enlarge the knowledge base of medical practitioners with respect to occupational health issues. First, occupational health and safety should be included as a specific subject in undergraduate medical programs. Second, upgrading and continuing education should be provided on a convenient basis for medical practitioners who are already employed.[4] Task force members believe that these two recommendations, if fully implemented, will provide physicians with a more sophisticated understanding of the relationship between work and health status. Programs of continuing education (in particular, the diploma courses in occupational health offered by some Ontario universities) would be especially useful for general practitioners, who are often involved in administering occupational health programs in small plants, particularly in small communities. The advisory council accordingly recommends:

ACOHOS RECOMMENDATION 83-4

> that the Minister of Labour continue to fund educational programs that are designed to upgrade the knowledge of physicians in the area of occupational medicine and increase the number of physicians with expertise in this area.

ACOHOS RECOMMENDATION 83-5

> that the Minister of Labour encourage the appropriate professional bodies to continue their efforts to develop certification programs for physicians who wish to practise in the field of occupational medicine. In the long run, certification should serve as one important criterion for evaluating the competence of occupational health physicians.

CONCLUSION

Council believes that the fundamental right of an employee to consult his or her own physician on work-related health matters should be supported, despite the administrative difficulties that can result. If there are major difficulties as a result of this approach, they could, in fact, be diminished by the appointment of a 'co-ordinating physician'. Council also recognizes the employer's right to appoint a physician to advise on and assist in the administration of health surveillance programs. Where management-appointed physicians have the support of labour as well as management, they may, in many circumstances, provide the necessary medical services for the health surveillance program.

Footnotes

1. Letter to Dr. J. F. Mustard, Chairman, ACOHOS, from Brian Goodman, Executive Director, Occupational Health and Safety Division, Ministry of Labour, August 3, 1983.
2. Report of the *Royal Commission on the Health and Safety of Workers in Mines* (Toronto: Government of Ontario, 1976).
3. Advisory Council on Occupational Health and Occupational Safety, *Third Annual Report* (Toronto: Government of Ontario, 1981) p.21.
4. *Ibid.*, p.28-29.

APPENDIX A

During its deliberations, the Task Force on Health Surveillance, Health Screening and Biological Monitoring in Occupational Health Programs sought the opinions of various individuals and organizations on the advantages and disadvantages of four approaches to choosing a plant physician to conduct an occupational health program. These approaches were:

- The selection of plant physicians by labour exclusively.
- The selection of plant physicians by management exclusively.
- The selection of plant physicians by a worksite's joint health and safety committee (i.e. one example of a joint labour/management selection process).
- The selection of plant physicians by an independent body.

TABLE 1: THE SELECTION OF PLANT PHYSICIANS BY LABOUR EXCLUSIVELY OR BY MANAGEMENT EXCLUSIVELY: THE ADVANTAGES AND DISADVANTAGES OF BOTH APPROACHES

ADVANTAGES OF SELECTION BY LABOUR/ DISADVANTAGES OF SELECTION BY MANAGEMENT

a) Since workers (and to some extent supervisors) are the only category of individuals whose health may be adversely affected as a result of occupational exposure to hazardous agents, they alone should have the right to choose a plant physician.

b) On the basis that the individual ordinarily selects the physician who will treat and advise him, it seems anomalous, in the context of occupational health programs, that the physician with responsibility in those areas should be chosen by a third party.

c) Where workers have the exclusive right to appoint a plant physician, they will have maximum confidence in the quality of the occupational health program in which they are asked to participate.

d) An arrangement wherein plant physicians are appointed and paid by management may, in some situations, bring subtle influences to bear on these practitioners to act against the best interests of workers. The plant physicians could, in this respect, be induced not to:

i) Inform a worker that the worker is suffering from an occupationally induced disease.

ii) Advise a worker that continued exposure in a hazardous work site could cause the worker's health to deteriorate.

iii) Inform a prospective job candidate that a pre-employment examination has revealed a potential health problem.

iv) Instruct a worker to seek the advice of a medical specialist.

ADVANTAGES OF SELECTION BY MANAGEMENT/ DISADVANTAGES OF SELECTION BY LABOUR

a) Since, by virtue of section 15 of The Occupational Health and Safety Act, employers are given the primary responsibility for maintaining a healthful workplace, management must have the freedom to choose the professionals necessary to implement an effective occupational health program.

b) Physicians who are presently employed by companies have the fullest degree of knowledge about the health hazards encountered in their plants.

c) Where workers in a plant are given the right to choose an occupational health physician, there is the risk that the individual who is selected will side with labour in health disputes, at the expense of scientific objectivity.

d) Should a novel administrative arrangement be introduced for the appointment of plant physicians, considerable dislocation could be imposed on existing occupational health programs. Moreover, there is no guarantee that placing the selection of plant physicians in the hands of labour would have an appreciable impact on the quality of occupational health programs in the province.

e) Since the maintenance of a healthful working environment depends on a team approach towards the control of occupational hazards, an arrangement whereby the plant physician is appointed by one body, and all other health professionals by another, might cause frictions to develop between team members and lead to an unco-ordinated approach to the control of workplace hazards.

f) Should workers be accorded the right to select a plant physician, it is unlikely that many employers would retain a second physician for management advisory functions. As a result, there is the possibility that physicians will no longer act as the principal advisors to management on such matters as the choice of safe exposure levels. (Some individuals consider this to be an advantage).

e) Pressure exerted by management could also cause a plant physician to:

   i) Use the pre-employment examination to obtain details about a worker's medical history that are not relevant to the issue of whether a worker is fit to perform a particular job task.

   ii) Permit an employer or other parties to gain access to a worker's medical records.

   iii) Side with management on issues relating to fitness for work and entitlement to workers' compensation benefits.

f) A physician who is appointed by labour will likely be less susceptible to perceived management influences. As a result, he will be seen as discharging his duties in a more objective fashion.

g) Since some workers believe i) that company sponsored health surveillance programs have, as one objective, the removal of workers who are considered to be undesirable, and ii) that physicians employed by companies will communicate the results of tests to employers (or to other third parties) without the consent of the worker, these individuals will be reluctant to disclose pertinent health information to plant physicians. In addition, some employees may refuse to participate in company sponsored health surveillance programs.

Note: Neither the labour nor the management option described above incorporates the principle of joint labour-management responsibility for occupational health in the workplace. While some individuals believe that this principle should extend to the appointment of plant physicians, others feel that a consensual approach towards occupational health and safety (which would include the selection of a physician by a joint committee) obscures the fact that labour and management often have fundamentally different interests with respect to health and safety issues. It is argued, in this context, that either the labour or the management option would be preferable to the joint arrangement since, under the first two schemes, the conflicting views of labour and management would be brought into sharper focus.

g) There is little hard evidence to suggest that physicians employed or retained by companies in Ontario have acted in contravention of the law or have breached professional ethics.

TABLE 2: THE SELECTION OF PLANT PHYSICIANS BY A WORK SITE'S JOINT HEALTH AND SAFETY COMMITTEE: THE ADVANTAGES AND DISADVANTAGES OF THIS APPROACH

ADVANTAGES

a) Since both the Ham Commission Report and *The Occupational Health and Safety Act* have accepted the principle that the protection of health in the workplace should be a joint responsibility, it seems inconsistent that the prerogative of appointing the plant physician should rest with either management or labour exclusively.

b) Where workers are given some responsibility for the choice of a plant physician, they will likely have more confidence in the quality of the occupational health program in which they are asked to participate.

c) A physician who is appointed by a joint health and safety committee will likely be less susceptible to pressures from either labour or management. As a result, he will be perceived as discharging his duties in a more objective fashion.

DISADVANTAGES

a) On the basis that the individual ordinarily selects the physician who will treat and advise him, it seems anomalous, in the context of occupational health programs, that management should participate in the choice of the physicians who will perform these duties.

b) Where a plant physician is responsible to both labour and management, the cohesiveness of the occupational health program that the physician organizes may be less than optimal.

c) Where the power to appoint plant physicians is delegated to the joint health and safety committee, aspiring occupational health physicians may perceive that the objective practice of occupational medicine will be stymied because of perpetual labour management disagreement on health and safety matters. As a result, it may become more difficult to recruit and to retain competent professionals to serve as plant physicians.

d) There is also the risk that, once the physician is appointed, he may, in fact, become subject to conflicting pressures from labour and management.

e) Since the maintenance of a healthful working environment depends on a team approach towards the control of occupational hazards, an arrangement whereby the plant physician is appointed by one body, and all other health professionals by another, might cause frictions to develop between team members and lead to an unco-ordinated approach to the control of workplace hazards.

f) Should a novel administrative arrangement be introduced for the appointment of plant physicians, considerable dislocation could be imposed on existing occupational health programs. Moreover, there is no guarantee that placing the selection of plant physicians in the hands of joint health and safety committees will have an appreciable impact on the quality of occupational health programs in the province.

g) Should the joint health and safety committee be accorded the responsibility of selecting a plant physician, it is unlikely that many employers would retain a second physician for management advisory functions. As a result, there is the possibility that physicians will no longer act as the principal advisors to management on such matters as the choice of safe exposure levels. (As indicated earlier, some individuals consider this to be an advantage).

TABLE 3: THE SELECTION OF PLANT PHYSICIANS BY AN INDEPENDENT BODY

ADVANTAGES	DISADVANTAGES
a) If plant physicians were to be appointed through a government agency or a medical advisory service, this could provide a mechanism to ensure that only those physicians competent in the field of occupational health would be permitted to supervise programs of health surveillance in the workplace. (Some individuals would argue, however, that an undue emphasis on technical competence may cloud the fact that the practice of occupational medicine also involves value judgments).	a) On the basis that the individual ordinarily selects the physician who will treat and advise him, it seems anomalous, in the context of occupational health programs, that the physician with responsibility in these areas should be chosen by a third party.
b) Under the present decentralized arrangement for the delivery of health surveillance programs in the province, only a small percentage of plants will retain the services of occupational health physicians. Should surveillance services be provided through an independent agency, however, there would be a greater likelihood that more work sites could have access to these health professionals.	b) Physicians appointed by an independent body might not have specific expertise with respect to i) the work processes conducted in different plants, and ii) the health hazards associated with such processes.
c) Should medical advisory services be given a role in the appointment of plant physicians and in the development of health surveillance programs, these agencies could serve as valuable resource facilities for physicians in the field.	c) Since the maintenance of a healthful working environment depends on a team approach towards the control of occupational hazards, an arrangement whereby the plant physician is appointed by one body, and all other health professionals by another, might cause frictions to develop between team members, and lead to an unco-ordinated approach to the control of workplace hazards.
d) Where plant physicians are appointed by and report to independent bodies, it might be possible to have these agencies provide facilities for the storage of medical data on individual workers. Should this occur, the possibility that confidential information might fall into the wrong hands would be reduced.	d) Should an independent body be given the right to appoint a plant physician, it is unlikely that the employer would retain a second physician for management advisory functions. As a result, there is the possibility that physicians will no longer act as the principle advisors to management on such matters as the choice of safe exposure levels. (As indicated earlier, some individuals consider this to be an advantage).
e) Under this type of administrative arrangement, workers would be expected to have confidence in the impartiality of the physician who is assigned to their plant. (The level of acceptance would be enhanced where representatives of labour sat on the governing body of the independent agency).	e) Should a novel administrative arrangement be introduced for the appointment of plant physicians, considerable dislocation could be imposed on existing occupational health programs. Moreover, there is no guarantee that placing the selection of plant physicians in the hands of an independent agency will have an appreciable impact on the quality of occupational health programs in the province.
f) This sort of administrative scheme could provide occupational health physicians with a level of job security that might be difficult to achieve under a different system. (Some individuals consider this to be a disadvantage).	

Ontario

Office of the
Minister

Ministry
of
Labour

400 University Avenue
Toronto, Ontario
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(416) 965-4101

February 21, 1984

Dr. Dennis McCalla
Chairman
Advisory Council on Occupational Health
and Occupational Safety
15th Floor
400 University Avenue
Toronto, Ontario
M7A 1T7

Dear Dr. McCalla:

Thank you for transmitting Advisory Memorandum 83-3 concerning the role of the physician in medical surveillance programs and in particular those established by a designated substance regulation. As part of the review of this matter, my officials would like to seek comment from outside parties on the advice. In order to do so, I request Council's consent to release this document to the public.

Yours sincerely,

R. H. Ramsay,
Minister

Ontario
Advisory Council on
Occupational Health &
Occupational Safety

Office
of the
Chairman

400 University Avenue
Toronto, Ontario
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416/965-2448

March 15, 1984

The Honourable R. H. Ramsay
Minister of Labour
400 University Avenue, 14th Floor
TORONTO, Ontario

Dear Mr. Ramsay:

This is further to your letter of February 21, 1984 in which you requested council's consent to release Advisory Memorandum 83-III, concerning the role of the physician in medical surveillance programs, to outside parties for their comments.

The Advisory Council certainly has no objection to the release of this memorandum.

Yours sincerely,

D. R. McCalla
Chairman

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Advisory Memorandum 83-IV

Ontario

Advisory Council on
Occupational Health &
Occupational Safety

Office
of the
Chairman

400 University Avenue
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M7A 1T7
416/965-2448

March 23, 1984

The Honourable R. H. Ramsay
Minister of Labour
400 University Avenue
Toronto, Ontario
M7A 1T7

Dear Mr. Minister:

On behalf of the Advisory Council, I am pleased to submit Advisory Memorandum 83-IV, New Chemical and Biological Agents in the Workplace: Identification and Control of Carcinogens and Potential Carcinogens.

The process of formulating the recommendations in this memorandum has involved several steps and many factors have been considered. The Report of the Special Advisory Committee on Carcinogens served as a background paper reviewing the process of chemical carcinogenesis and means of detecting potential carcinogens. Basic issues were set out in a Discussion Paper on the Control of Workplace Carcinogens. Both papers were circulated widely and council reviewed the 33 briefs and five oral presentations from labour, management and professional groups. Detailed consideration was given to the responses and other issues which were raised in the briefs and presentations.

Council attempted to reconcile the often very different positions and opinions of the various groups concerned with carcinogens in the workplace and/or the programs proposed to identify and control their use.

Increasing recognition of the importance of identifying and controlling carcinogens and recent efforts towards national and international collaboration and co-ordination of policies in this important field have influenced the approach taken by council.

The series of recommendations contained in this document provides a basis for the development of policies and procedures necessary to identify and control new chemical and biological agents which may pose a carcinogenic risk in the workplace.

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I trust that the advice included in the memorandum will prove useful to you and look forward to your response.

Yours very truly,

DRMcCalla

D. R. McCalla
Chairman

Encl.

c.c. T. E. Armstrong, Q.C.
Dr. A. E. Robinson
Mr. B. Goodman

Advisory Memorandum 83-IV
to the Minister of Labour
March 23, 1984

New Chemical and Biological Agents in the Workplace: Identification and Control of Carcinogens and Potential Carcinogens

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INTRODUCTION

Toxic substances in the workplace is a broad area of concern to workers, management and government alike and has been the subject of considerable legislation under the *Occupational Health and Safety Act*. Carcinogens in the workplace is part of this concern that is often singled out for specific consideration.

The reasons for specific concern about carcinogens include:

1) the fear and feeling of powerlessness people have about cancer;
2) the increased recognition that prevention is one important means of controlling cancer in our society;
3) the fact that the effects of carcinogens are often not manifested for decades, at which time the changes are usually irreversible;
4) the fact that identification of potential carcinogens is becoming feasible through methods that can reduce the risk and exposure of humans to carcinogens.

The Advisory Council on Occupational Health and Occupational Safety set up a special advisory group to deal with the methods for identifying, assessing and controlling cancer risks (those associated with current practices as well as potential hazards of new chemical and biological agents). The committee's background document,[1] describing the problems of carcinogens in the workplace, and council's discussion paper,[2] outlining many of the issues, were circulated to major industries, labour organizations and related agencies and are published in council's Fourth and Fifth Annual Reports, respectively. The task force (composed of the advisory committee plus a representative from labour and a representative from management) considered the briefs received and oral presentations made, and developed a number of recommendations for identifying and controlling the carcinogenic risk of new chemical and biological agents in the workplace.

This paper will briefly describe these issues and the deliberations on the responses to the discussion paper from labour, management and other agencies.

Interpretations

For the purposes of this document, a 'new chemical or biological agent' refers to a chemical or biological agent that was not in use in the workplace in Ontario before October 1979, or is not listed on the U.S. *Toxic Substances Control Act* (TSCA) inventory June 1980, or has not had a notification previously submitted to the Ministry of Labour under section 21 of the *Occupational Health and Safety Act*.

'Carcinogen' refers to a substance that causes an increase in the incidence of cancer. 'Carcinogenic risk' is a term used by the International Agency on Research into Cancer (IARC) to circumvent some of the problems of defining a human carcinogen, and refers to 'the probability that exposure to a chemical or complex mixture or employment in a particular occupation will lead to cancer.'[3] By using the term 'carcinogenic risk', substances can be included for which there is not sufficient evidence in humans for these substances to be defined as human carcinogens but for which there is 'sufficient evidence'* of a carcinogenic effect in laboratory tests and animal studies for there to be concern that they would probably cause cancer in humans.

The term 'carcinogenic risk' combines two concepts, both of which involve probabilities:

1) the likelihood that the agents or conditions will increase the incidence of cancer;
2) the likelihood that an individual will be exposed to the agent in a form or manner that could lead to the agent exerting its carcinogenic potential.

In this paper, the term 'potential carcinogen' is used to describe a chemical or biological agent that is considered likely to cause an increased incidence of cancer in a human population exposed to the agent; in other words, an agent that is considered likely to pose a carcinogenic risk to humans.

The control of many types of toxic substances involves setting exposure limits (threshold dose levels). A typical definition of 'threshold dose level' is that level of exposure to which most workers can be exposed for eight hours a day, 40 hours a week, 52 weeks a year for up to 40 years without incurring an adverse health effect. Protection is not guaranteed for the susceptible, the aged or children; hence, for reaching standards for the public, the threshold dose level is generally divided by a factor of 10. However, it is difficult to set meaningful exposure limits for new chemical or biological agents when there has been no human experience. The premise of this paper is that the approach to new chemical and biological agents that may have the potential of causing cancer should be conservative, and that all new chemical and biological agents should receive an appropriate degree of testing before they are permitted in the workplace.

THE APPROACH TO IDENTIFICATION AND CONTROL OF NEW CHEMICAL AND BIOLOGICAL AGENTS THAT MAY POSE A CARCINOGENIC RISK IN THE WORKPLACE

A. National and International Co-operation and Reporting Mechanisms

In several jurisdictions, carcinogen identification and control programs are organized nationally or among groups of countries. For example, the Organization for Economic Co-operation and Development (OECD)[4] (representing 24 countries) and the European Economic Community (EEC)[5] have developed guidelines for the testing and classification of chemicals, which include a section on carcinogens. The role of these international organizations, or of any agency without relevant legislative authority, can only be to endeavour to ensure that the policies of their members are based on the most up-to-date, scientifically valid, internationally acceptable information. Final policy decisions must be made by the individual governments with the legal mandate and the responsibility for regulatory programs. Individual countries make policies within this basic framework. For example, the Environmental Protection Agency (EPA) in the United States has based policy[6] on the OECD Guidelines. Similarly, Canada has signed a 'letter of intent' to adopt the OECD Guidelines for reporting and testing new chemicals. The Department of the Environment, in collaboration with Health and Welfare Canada, is drafting legislation under the *Environmental Contaminants Act* to amend the section dealing with reporting new chemicals to allow it authority to control and regulate the use of new chemicals. However, the political realities of divided jurisdiction in Canada make a national control program difficult to mandate unless there is agreement between the provinces. The purpose of the Federal Provincial Workshop on New Chemicals held in November 1982 was to promote harmonization of the international, national and provincial approaches to notifications and information requirements for dealing with new chemicals, and to formulate appropriate recommendations in the Canadian context.

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*The terms 'sufficient evidence', 'limited evidence' and 'inadequate evidence' are defined by the International Agency for Research on Cancer (IARC) as the various assessments of evidence for carcinogenicity from studies in experimental animals. The precise definitions are presented in Appendix I.

The Canadian Association of Administrators of Labour Legislation (CAALL) Occupational Safety and Health Committee Task Force has initiated a Workplace Hazardous Materials Information System Project. The core working group and subcommittee consist of members from labour, management and related federal departments. Provincial governments are represented *ex officio* on these working groups. The issues presently being addressed are:

1) defining appropriate classes of hazardous materials and criteria for categorizing each class;
2) defining minimum requirements for: labelling, material safety data sheets (MSDSs), and worker education;
3) the socio-economic impact analysis of the effects of implementing the system;
4) the need for complementary federal/provincial legislation to ensure effective implementation of the system.

The final report is expected to be presented to the federal Deputy Minister of Labour in 1984.

National and international inventories of chemicals are being assembled in the U.S. under the *Toxic Substances Control Act* and in Europe by the European Economic Community (EEC); however, there is no separate section for carcinogens, and considerable problems are being experienced in the handling of proprietary information.

It appears that there is general acceptance of the philosophy that all new chemicals should be screened and that if any are considered likely to pose a carcinogenic risk, their use in industry should be controlled.

Respondents to the discussion paper generally supported the proposals for international and national communication and co-operation. However, some respondents felt that the existence of international guidelines and national policies should not preclude Ontario from reviewing and, if necessary, modifying the policies to address the specific needs or concerns experienced in Ontario. However, Canada is a member of the OECD; hence, any policies created by Ontario should be consistent with the principles and guidelines developed by the OECD and signed by Canada. Some respondents expressed concern that regulations specific for Ontario would cause considerable expense to companies manufacturing in Ontario or importing to Ontario and would set up national and international trade barriers.

1. *Present Situation in Ontario in Relation to New Chemical or Biological Agents*

In section 11 of the new and, as yet, unproclaimed *Health Protection and Promotion Act*, the medical officer of health has the responsibility to respond to complaints regarding a health hazard related to occupational or environmental health. Following an investigation, he has the mandate to take various actions. However, also in section 11, the medical officer of health is required to '. . . notify the ministry of the Government of Ontario that has the primary responsibility in the matter. . . .' In the case of occupational health and safety, the Ministry of Labour has primary responsibility.

In Ontario, under section 20 of the *Occupational Health and Safety Act*, the director of occupational health (Director) is allowed to:

a) prohibit,
b) limit or restrict in such manner as the Director specifies, or
c) subject to such conditions regarding administrative control, work practices, engineering control and time limits for compliance as the Director specifies,

a substance used in the workplace if, in his opinion, it is likely to endanger the health of a worker.

According to section 21(1):

> 'Except for purposes of research and development, no person shall, a) manufacture; b) distribute; or c) supply, for commercial or industrial use in a work place any new biological or chemical agent or combination of such agents unless he first submits to a Director notice in writing of his intention to manufacture, distribute or supply such new agent or combination of such agents and the notice shall include the ingredients of such new agent or combination of agents and their common or generic name or names and the composition and properties thereof.'

The 'Guidelines for the Notice of Intent to Manufacture, Distribute or Supply a New Chemical Agent or Combination of Such Agents' set out that information which should be supplied for each new chemical. At the discretion of the director, further testing can be requested. Examples of the categories of tests are appended (Appendix 2).

The Ministry of Labour toxicologist assigned to review the information provided in the notification will evaluate the data submitted according to definitive test standards such as those used under the *Toxic Substances Control Act* (TSCA) for oncogenic (carcinogenic), non-oncogenic chronic, and combined oncogenic and non-oncogenic chronic health effects that have been published (44 FR No.91, May 9, 1979) and the test standards that have been proposed for mutagenic effects, teratogenic and reproductive effects, general metabolism testing, and a variety of acute and sub-chronic toxicity studies (44 FR No.145, July 26, 1979).

B. Considerations

Most respondents to the discussion paper cited the existing and quite extensive legislation for toxic substances, and raised the issue of whether separate specific legislation is required for carcinogens or whether carcinogens are a category of toxic substances that can be adequately handled on a substance-by-substance basis under the present legislation.

It is recognized that new chemical or biological agents should be screened for toxic effects taking account of two types:

1) readily identifiable reversible effects, like dermatitis;
2) effects that may not be detected for years and that involve changes that may not be reversible, like chronic chest disease and cancer.

Because of these differences, and the special concern people have about cancer, the council considers that a separate approach to the regulation of workplace carcinogens is warranted. However, such approaches could be applicable to all agents that cause the delayed onset of chronic, often incurable, diseases.

In the discussion paper, the question was raised whether there should be an advisory committee to advise the Minister of Labour on all aspects of the regulatory program for carcinogens. Generally, the respondents supported the concept of an advisory committee; however, there were mixed views regarding the composition and role of such a committee.

Some respondents fully supported a scientific advisory committee to assess the carcinogenic risk, but had reservations about advisory committees making recommendations on methods of control.

Council sees the need for a highly credible group of experts, independent of management, labour and government, to review the available evidence and to classify new chemical and biological agents. However, the mandate for such a scientific advisory committee should be restricted to classification and should not extend to the areas of regulation and control, which should remain the responsibility of the Minister of Labour.

The process of risk identification for new chemical and biological agents starts with the testing performed by the manufacturer or importers investigating the properties and gathering the information necessary for completing a notification according to the 'Guidelines for the Notice of Intent to Manufacture, Distribute or Supply a New Chemical Agent or Combination of Such Agents' for the Ministry of Labour. Although this form mentions mutagenicity testing and inquires whether carcinogenicity testing has been performed, these tests are not mandatory. The policy states that the toxicologist assesses the chemicals and the results of the basic tests and decides, in consultation with the Director of Occupational Health, whether further testing is required.

It is recommended that, as a minimum, short-term data on the potential carcinogenicity of all new chemical and biological agents should be required as part of pre-market notification.

C. Carcinogenicity Testing

Long-term animal carcinogenicity testing is considered to give the most reliable indication of whether or not a chemical or biological agent is likely to be carcinogenic to humans. As noted in the *Report of the Special Advisory Committee on Carcinogens*,[1] these tests are slow and expensive, so it is not reasonable to demand that all new chemicals should undergo such testing before introduction to the workplace. Short-term tests have been developed which, if used appropriately, will detect many potential carcinogens. These tests are fast and relatively cheap. Council recommends that a tier system of tests should be applied to all new chemical and biological agents entering the workplace.

However, council also recognizes that it is unlikely that any system of screening will detect all carcinogens. (No species other than humans has developed tumours following exposure to arsenic). This is a serious concern, especially when the effects of carcinogens are not manifested for many decades, by which time a whole generation of workers may have been exposed. Nevertheless, intelligent application of the available techniques will minimize this risk.

The Report of the *Special Advisory Committee on Carcinogens*[1] described some of the tests that can be used to assess carcinogenic potential.

For the purposes of this advisory memorandum, the tests are grouped into three broad categories and represent tiers of testing:

1) short-term *in vitro* tests,
   e.g. — Ames test
   — unscheduled DNA synthesis in rat hepatocytes;
2) short-term *in vivo* tests,
   e.g. — *in vivo* cytogenetics
   — micronucleus test;
3) long-term animal tests.

In its previous documents council identified two levels of tests. A tier system of testing for carcinogens was endorsed by a number of respondents to the council's discussion paper.[2] One example currently in use (Appendix 3) utilizes the three categories of tests identified above. Council recommends that testing guidelines should be flexible and allow choice in the number and nature of the tests performed. Such flexibility is necessary to allow selection of the most appropriate tests for each chemical and to permit the use of new or improved test procedures as they become available. The responsibility for testing or for making the appropriate arrangements for testing should lie with the manufacturer/importer of the chemical or biological agent, and the tests should be performed in a manner consistent with the OECD or the forthcoming U.S. 'Guidelines for Good Laboratory Practice'.[7] The decision to proceed with the next tier of testing should depend on: the results and adequacy of tests to date, an assessment of other biological properties, use and application of the chemical, anticipated degree and route of human exposure, and considerations of the possible mechanism of action of the chemical or biological agent. The manufacturer or importer of the chemical should be expected to provide full justification for the selection of the particular tests chosen.

The issue of whether the testing should be performed on the pure chemical or the technical grade material or upon the commercial product is not easily resolved. Ideally, testing should be performed on both the pure chemical and the technical grade material to which workers are exposed. However, it is not possible to set out detailed rules that can be reasonably applied in all circumstances since the composition of the technical grade material may vary and the chemical may be used in the form of a mixture. The time delays and cost make it unreasonable to demand new tests when there are small variations in composition.

In the United States and many European jurisdictions, if a particular mixture has not been tested, and it contains one per cent or more of a hazardous chemical or 0.1 per cent or more of a carcinogen, the mixture is considererd to be as hazardous or carcinogenic as its components and is required to be labelled and controlled accordingly.

D. Classification

Three categories of chemical and biological agents were identified in the discussion paper: I carcinogens, II suspect carcinogens, III non-carcinogens. Respondents to the paper felt that without a clear definition of terms and with no distinction made between new chemicals and chemicals in the workplace, a large number of the chemicals would be placed in Category II, and this would not help policy makers determine a control program. It should be pointed out that the purpose of this classification scheme is to create broad groups of chemical and biological agents that can be considered together for regulatory purposes. In light of the comments from the respondents to the discussion paper, the following revised categories are suggested:

Category 1 – Chemical or biological agents for which there is 'sufficient evidence'* for them to be considered likely to pose a carcinogenic risk to humans.

2 – New chemical or biological agents for which there is 'limited evidence'* for them to be considered likely to pose a carcinogenic risk, and those which give positive results in Tier 1 and/or Tier 2 tests but have not yet been subjected to long-term animal tests. Substances would only be

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* The terms 'sufficient evidence', 'limited evidence' and 'inadequate evidence' are defined by the International Agency for Research on Cancer (IARC) as the various assessments of evidence for carcinogenicity from studies in experimental animals. The precise definitions are presented in Appendix 1.

placed in this category temporarily, until further testing is done to provide 'sufficient evidence' to classify it as a carcinogenic risk (Category 1) or not (Category 3).

3 – Chemical and biological agents considered unlikely to pose a carcinogenic risk to humans.

The categorization of new chemical and biological agents should be subject to change dependent upon the review and assessment of new data.

The manufacturer, importer or any other organization performing tests on new chemical and biological agents should submit toxicological data to the ministry after notification under section 21 of the Act as it becomes available.

E. Control and Regulation of Potential Carcinogens

Once a chemical or biological agent is considered to pose a carcinogenic risk, the control or regulation of that chemical or biological agent becomes an issue.

Respondents to the discussion paper held varying views on what the most appropriate controls are. Labour groups tended to advocate zero exposure, reiterating the points that there is no unequivocal evidence that there are 'safe levels' of carcinogens and that the cost of excessive human exposure is too high. While generally varied in their responses, management groups acknowledged that the health and safety of the workers is the issue, but drew attention to the need to consider the other components of risk assessment, such as levels and routes of human exposure and the social and economic implications of the various control mechanisms.

Chemical and biological agents in Category 1 or 2 should only be used under conditions that ensure, to the fullest extent possible, that workers' health will not be impaired. The objective should be to avoid any exposure; however, with increasing sensitivity of detection methods, 'zero exposure' standards are considered impractical. Therefore, for each substance in Category 1 or 2 a decision will have to be made to establish the maximum level of exposure that will be permitted. If the exposure cannot be reduced to, or below, this limit the use of the substance should not be allowed, at least until the necessary technological advances are made to ensure that the maximum exposure limit will not be exceeded. Regardless of the limit set, there should be a continual effort to reduce the level of exposure by incorporating technological improvements into the control programs for substances in Category 1 or 2, and personal protective equipment should be available for the workers' use.

F. Work Histories and Epidemiological Surveillance

The most important reasons for considering carcinogenic risk separately from most of the other hazards posed by new chemical and biological agents are: 1) there is an extended period of time between the exposure to a carcinogen and the development of cancer, and 2) the effects of exposure are not reversible. For these reasons, it was agreed that if new chemicals or biological agents that have been placed in Category 1 or 2 are used in the workplace, epidemiological surveillance must be performed. The majority of the respondents to the discussion paper supported the basic concept of epidemiological surveillance; however, there were divergent opinions on the extent of the surveillance and the components required. The basic requirements for the surveillance should be:

a) records of exposure,
b) health surveillance, and
c) a method of retaining these records with sufficient identifiers to allow for record linkage to vital statistics and the Ontario Cancer Registry for at least 40 years after initial exposure or 20 years after final exposure, whichever is longer.

However, for new chemical and biological agents whose effects on humans are unknown, meaningful health surveillance will often be difficult to perform. Hence, record linkage is essential to determine the incidence of cancer and allow epidemiological studies to examine the situations where there appears to be a higher incidence of cancer in exposed individuals. Such studies should allow any increased risk of cancer in humans to be detected as soon as possible.

Council considers it impractical to advocate complete epidemiological surveillance for new chemical and biological agents considered unlikely to pose a carcinogenic risk, but does advocate that work histories should be maintained. The work histories should contain a list of all the new chemical or biological agents to which each worker is exposed.

Council, in its Advisory Memorandum 80-IV, recommended to the Minister of Labour that:

1) '. . . employment and exposure records are maintained for workers employed in workplaces where a known carcinogen or toxic agent that produces serious health effects is in use;' (80-IV, 34)
2) '. . . all employers who keep and maintain medical and exposure records, as specified under the Act and regulations', (be required to) 'advise the Ministry of Labour of the fact;' (80-IV, 35)
3) '. . . all records of exposure to carcinogenic and toxic agents kept pursuant to the *Occupational Health and Safety Act* and regulations should include a personal identifier;' (80-IV, 30)
4) 'the Minister of Labour enter into consultations with the Minister of Health to examine the utility of coding unique personal identifiers on health records for use in occupational health related epidemiological research. The health records which should be considered for coding are OHIP files, hospital records and special disease files, such as cancer registers;' (80-IV, 32) and
5) 'the Minister of Labour . . . ensure that worker exposure records, in addition to medical records, kept pursuant to the Act and regulations are transferred to the Occupational Health Medical Service of the Ministry of Labour for future maintenance when the employers or physicians who are required to maintain these files are no longer

> able to do so. In the long run, the minister should consider the option of creating a central storage system for exposure records collected in the province.' (80-IV, 36)

Record linkages were also recommended by council in September 1979 in the report on confidentiality of information.

The Ministry of Labour sent a copy of the recommendations to the Ministry of Health for review and comment; the review to be carried out within the context of that ministry's review of the *Report of the Commission of Inquiry Into the Confidentiality of Health Information*.

G. Confidentiality

Confidentiality of information on new chemical or biological agents is controversial. All agree that the workers have the right to know the hazards and risk of the chemical and biological agents that they are exposed to in their workplace. However, whether or not this should include a knowledge of the chemical name is hotly debated. Some management briefs expressed the need to protect their 'inventions' and were therefore unwilling to divulge chemical names. In Ontario and other jurisdictions, the companies are required to report the chemical structures to the government at the pre-marketing notification stage. This allows governments to check any testing that is necessary and, secondly, to prepare an inventory of chemicals. However, this information is kept confidential and not divulged to the public or any other group. All requests for information are directed back to the company.

Council, in considering the briefs, recognizes both the desire of the workers to be fully informed of the possible hazards and industry's need for confidentiality.

The Occupational Safety and Health Administration (OSHA) in the U.S. requires that for each hazardous chemical a Material Safety Data Sheet (MSDS) should be developed or obtained by the manufacturer or importer, and should be available at all workplaces using the chemical. The regulation specifies the information that must be provided on the MSDS and available to employees. It requires that the chemical name be divulged unless it is a trade secret; however, the trade secret claim has to be supported, the hazards reported, and, in the case of an emergency, the chemical name should be divulged to the treating physician or nurse. In this latter case, the manufacturer or importer can require a written statement of need and confidentiality agreement.

H. Chemical Inventory

It has been suggested that a chemical inventory should be produced and available in all workplaces, and that each chemical should be accompanied by an information sheet stating any hazards or potential health risks, proper handling procedures: a) for general use, b) for emergencies, and c) for transportation; and the potential for environmental damage in case of spills. There has been discussion about developing a standardized Material Safety Data Sheet (MSDS) at the national level; however, action has been stalled due to lack of agreement about whether any of the data on biological or lack of biological effects could be considered proprietary information for the manufacturing company that has paid for the extensive and expensive testing. Until this issue is resolved at a national level, Ontario has been reluctant to develop its own MSDS.

In the meantime, many multinational and national chemical producers and importers are using MSDSs based on OSHA Form 20 (Appendix 4). As the use of these sheets is voluntary in Canada, the information provided is often incomplete. OSHA has recently developed a new policy specifically outlining the information required on MSDSs in the U.S. (Appendix 5).

The Canadian Centre for Occupational Health and Safety is forming a computerized data bank on information provided on the MSDSs that are being submitted by industry.

Specific information required and the criteria for developing MSDSs are being studied as an integral part of the Workplace Hazardous Materials Information System Project now sponsored by Labour Canada. It is considered beyond the mandate of this paper on the identification and control of carcinogens in the workplace to address the matter beyond its specific application to new chemical and biological agents placed in Category 1 or 2.

RECOMMENDATIONS

The following recommendations have been formulated to deal with the process of identification and control of new chemical or biological agents that may pose a carcinogenic risk in the workplace.

This paper does not address the important and complex subject of chemicals currently in use in the workplace that have not been adequately tested.

The recommendations are based on the following considerations:

1) The contribution of workplace chemicals to the development of human cancer must be minimized.
2) It is not feasible to insist on full-scale animal carcinogenicity tests for all new chemical and biological agents in the workplace. Promising short-term tests have been developed, and it is proposed that these should be used in a tier system (to determine which chemical and biological agents should undergo complete animal carcinogenicity testing). Such a system will not be perfect, and it must be expected that some carcinogenic compounds will continue to escape detection. Therefore, records of the new chemical and biological agents to which workers are exposed must be maintained.
3) It will generally be impossible to arrive at meaningful quantitative human risk assessments from the data available for new chemical and biological agents.
4) Workers have the right to know and employers have the responsibility to inform employees of the nature and hazards of the chemical and biological agents that they handle or work with.

National and International Co-ordination and Co-operation in the Identification and Control of Carcinogens

Jurisdictions around the world are struggling to develop control programs to protect workers and consumers from hazardous chemical substances and biological and physical agents. International organizations and agencies are developing chemical inventories and guidelines for laboratory practice, testing procedures and interpretation of data so that individual countries can base their control policies on a common, universally acceptable data base. However, if trade barriers are to be avoided, there must also be harmonization of the policies both nationally and internationally.

ACOHOS RECOMMENDATION 83-6

that the Minister of Labour take the necessary steps to develop, as expeditiously as possible, policies and procedures to identify and control the use of new chemical and biological agents that pose a carcinogenic risk in the workplace, and, at the same time, co-ordinate these efforts with those of the federal government, other Canadian jurisdictions, the governments of Canada's major trading partners and international agencies.

ACOHOS RECOMMENDATION 83-7

that the Minister of Labour ensure that the policies and procedures referred to in ACOHOS Recommendation 83-6 are developed according to the principles identified in the following set of recommendations.

A. Reporting Requirements for New Chemicals

A.1 The Minister of Labour should ensure that the notification under section 21 of the Act is completed as appropriate for the chemical or biological agent and its uses, including the full chemical name and structure, the tests performed and the toxic properties (including mutagenicity and carcinogenicity). Where data on the potential carcinogenicity is lacking, the manufacturer or importer should be asked to carry out the appropriate tests before use of the chemical is allowed in the workplace.

A.2 Manufacturers, importers or other organizations performing tests on new chemical or biological agents should be required to submit all toxicological data on mutagenicity and potential carcinogenicity to the Ministry of Labour at pre-market notification or as it becomes available after the pre-market notification.

B. Identification of Potential Carcinogens

1. *Testing*

B.1 All new chemical and biological agents to be manufactured, distributed or supplied for use in a workplace should be tested for potential carcinogenicity prior to introduction into the workplace.

B.2 The testing program for new chemical and biological agents should be comprised of a tier system. The number and type of tests to be performed at each tier would depend on the nature of the specific chemical or biological agent, but should be adequate and based on the knowledge available. Whether additional tests are needed should depend on a review of the results of the tests already performed, taking account of: the nature of the chemical or biological agent; the quantity to be marketed; the use; the potential for, and route of, human exposure.

B.3 The testing should be done under laboratory conditions approved by the government and consistent with the 'Good Laboratory Practice' (GLP) guidelines developed by the Organization for Economic Co-operation and Development (OECD) or the equivalent guidelines recently developed in the United States.

B.4 The Minister of Labour should ensure that there is appropriate inspection of approved laboratories.

B.5 The purity of the chemical or biological agent to be used for testing should be considered on an individual basis with due consideration being given to the nature of the impurities or additives and the possibility of chemical reactions that might generate new compounds.

C. Classification

C.1 The assessment of the available evidence and probable carcinogenicity and the classification of all new chemical and biological agents should be performed by a scientific advisory committee composed of experts in the field. The advisory committee should be appointed by the Minister of Labour on the advice of the Advisory Council on Occupational Health and Occupational Safety and report to the Minister of Labour.

a) The new chemical or biological agents showing 'sufficient evidence'* to be considered likely to pose a 'carcinogenic risk'** in humans should be classified into Category 1.
b) New chemical or biological agents showing 'limited evidence'* of carcinogenicity in animals or that give positive results on short-term tests and are considered by the scientific advisory committee likely to pose a carcinogenic risk to humans should be classified in Category 2 and treated, temporarily, as potential carcinogens for regulatory purposes. Further testing should be undertaken to define whether the substances in this category belong in Category 1 or 3.
c) New chemical and biological agents that are considered unlikely to pose a carcinogenic risk to humans should be classified in Category 3.

C.2 The toxicological data on new chemical and biological agents that become available after pre-market notification should be reviewed and assessed by the Ministry of Labour and/or the scientific advisory committee as it becomes available to determine whether the agent should be reclassified.

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* The terms 'sufficient evidence' and 'limited evidence' are defined by the International Agency for Research on Cancer (IARC) (see Appendix 1) and refer to the evidence for carcinogenicity from studies in experimental animals.

** 'Carcinogenic risk' is defined as 'the probability that exposure to a chemical or complex mixture or employment in a particular occupation will lead to cancer.'[1]

D. Regulation or Control of Chemical or Biological Agents Considered to Pose a Carcinogenic Risk

D.1 No new chemical or biological agent placed in Category 1 or 2 should be used if a suitable*** non-carcinogenic alternative is available.

D.2 If there is no substitute available, a review of the toxicological data, proposed uses and likely human exposures should be performed to determine whether the chemical or biological agent in question should be banned or used under controlled conditions. The decision to substitute, ban, regulate or control new chemical and biological agents in Category 1 or 2 should be made by the Minister of Labour allowing for scrutiny of the process at the discretion of the Advisory Council on Occupational Health and Occupational Safety.

D.3 Each new chemical and biological agent in Category 1 or 2 should be considered on a case-by-case basis and, if the agent is not banned, a maximum exposure limit must be set at a level which, according to the best available evidence, will not cause an increased incidence of cancer in exposed workers. If the level of exposure cannot be reduced below this limit, the use of the agent should not be allowed until the necessary technological advances are made to ensure that the maximum exposure limit will not be exceeded.

D.4 The decisions to substitute, ban or control new agents in Categories 1 and 2 and the maximum exposure limits set should be reviewed whenever there is:

a) new data on health effects, or
b) new technology that can:
  i) alter the production process,
  ii) reduce the level of exposure, or
  iii) permit improved engineering containment of the process.

D.5 It should be incumbent upon the manufacturer or importer to demonstrate to the satisfaction of the Ministry of Labour that, on the basis of the best available evidence, a new chemical or biological agent in Category 1 or 2 can be used under conditions such that it will not cause any impairment of health or functional capacity. Included in such a demonstration must be: a description of the technological and engineering containment of the process, the anticipated exposure levels, the medical surveillance program where appropriate and the means of monitoring exposure, maintaining equipment and dealing with accidents.

*** The decision on what constitutes a 'suitable' alternative should be made on a case-by-case basis taking into consideration:
  1) the functional capacity - effectiveness,
  2) the economic feasibility - efficiency,
  3) the availability, and
  4) any anticipated health benefits
of the substitution.

Before the use of a new chemical or biological agent in Category 1 or 2 is permitted in a workplace, the workplace must be registered, and the Minister of Labour must be satisfied that:

a) the exposure level will be kept below the maximum limit;
b) there will be a continual effort to reduce the level of exposure using technological improvements;
c) adequate information on the attendant risks and the precautions required for routine and emergency handling and transportation of the chemical or biological agent will be communicated to the workers;
d) personal protective equipment will be available for emergencies, maintenance of plant or equipment, and for any workers who request it.

E. Work Histories and Epidemiological Surveillance

The recommendations in this section are pursuant to the recommendations in ACOHOS Advisory Memorandum 80-IV and reiterate the specific needs for keeping records on workers exposed to new chemical or biological agents that may be carcinogenic.

E.1 Records of individual work histories, including all new chemical or biological agents to which each worker has been exposed, should be maintained and available to the worker or his designated representative.*

E.2 If a new chemical or biological agent placed in Category 1 or 2 is allowed in a workplace under controlled conditions, individual exposure records and health surveillance records, where appropriate, should be maintained and available to the worker or his physician upon the request in writing of the worker; and in the case of a deceased worker, to the next of kin or personal representative of the worker, upon the request in writing of such next of kin or personal representative.

E.3 In keeping with ACOHOS Recommendation 80-IV, 29 (Appendix 6), the Ministry of Labour should co-operate with the Ministry of Health to establish record systems that would facilitate linkage of work histories, exposure records, OHIP files, hospital records and the cancer registry.

E.4 Following ACHOS Recommendation 80-IV, 30 (Appendix 6), the records required in Recommendations E2 and E3 above should be maintained for 40 years after initial exposure or 20 years after final exposure, whichever is longer, by the company, or in a central registry if the workplace closes or if the company no longer wishes to retain these records.

E.5 The Government of Ontario should allocate the appropriate resources to:

a) maintain the Cancer Registry in Ontario;
b) develop a system to allow record linkage with other relevant data bases.

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* For the purposes of this advisory memorandum a 'designated representative' means any individual to whom a worker gives written authorization to exercise a right of access.

F. Information to Workers

F.1 The Minister of Labour should ensure that at each workplace using new chemical and biological agents in Category 1 or 2, there is available to the workers:

1) an up-to-date inventory of the agents in Categories 1 and 2 that are in use at that workplace;
2) a material safety data sheet (MSDS) for each agent, which must contain:

    a) information on the potential hazards, and the precautions required for handling,
    b) the toxic properties,
    c) the chemical name,
    d) the per cent concentration and chemical name of all Category 1 and 2 agents present in any mixture;

3) a worker education program to inform workers of the hazards and precautions required for handling or working with the agents.

F.2 The Ministry of Labour should ensure that the information provided to the workers is up-to-date, and that it contains all the information on properties and health effects that the worker should know and understand while working with or handling agents in Category 1 or 2.

G. Material Safety Data Sheets (MSDSs)

Specific information to be identified and the criteria for developing MSDSs are being studied as an integral part of the Workplace Hazardous Materials Information System Project. It was considered beyond the mandate of this paper to address this matter beyond its application to new chemical and biological agents in Categories 1 and 2.

G.1 Before manufacture, importation or use of a new chemical or biological agent, the manufacturer or importer should submit an MSDS to the Ministry of Labour. The Ministry of Labour should ensure that the information is complete and adequate.*

G.2 MSDSs on all new agents or mixtures containing new agents in Category 1 or 2 should be available at all workplaces and should be provided to all purchasers.

G.3 The Ministry of Labour should ensure that the information on labels, medical and hygiene sheets is consistent with the information on the MSDSs.

G.4 The manufacturer/distributor/importer should be responsible for updating the MSDS and associated sheets when new information becomes available, and for drawing the attention of all purchasers to the new information.

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* The recommendations of the Workplace Hazardous Materials Information System Project are expected to identify specific criteria. For chemical and biological agents in Categories 1 and 2, minimum requirements should include: the chemical name, and the properties, health effects, suspected health effects and precautions necessary for handling and using the agent.

G.5 The Ontario Minister of Labour should work with his counterpart in other provinces to ensure that the information required for the MSDS in Ontario is the same as that used in other Canadian jurisdictions, and that it is co-ordinated with the requirements of other jurisdictions.

H. Research and Development

H.1 Small amounts of new chemical and biological agents used and developed exclusively for research purposes should be exempt from the general recommendations above. However, it should be the responsibility of the employer to ensure that workers are fully informed of the chemical nature and the potential hazards of new agents being used. The employer is also responsible for fully instructing the worker in the safe means of handling these agents, and ensuring compliance with safe work practices.

REFERENCES AND FOOTNOTES

1. Report of the Special Advisory Committee on Carcinogens, April 7, 1982. ACOHOS Fourth Annual Report, 1981-82.
2. The Control of Workplace Carcinogens: A Discussion Paper. Prepared by The Advisory Council on Occupational Health and Occupational Safety, June 1982. ACOHOS Fifth Annual Report, 1982-83, Volume 2.
3. International Agency for Research on Cancer. Monographs Supplement 4.
4. OECD Guidelines for Testing of Chemicals. Published by the Organization for Economic Co-operation and Development, Paris, 1981.
5. Council Directive 79/831/EEC, September 18, 1979 amended for the sixth time. Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labelling of dangerous substances.
6. Identification, Classification and Regulation of Potential Occupational Carcinogens. 45 Federal Register, 5001 (1980). See also: Advance Notice of Proposed Re-evaluation of Carcinogens Policy. 47 Federal Register, 187 (1982).
   EPA Toxic Substances Control Act, Section 4, Support Document Test Data Development Standards: Chronic Health Effects, Published by the United States Environmental Protection Agency, Washington, D.C., 1979.
7. Good Laboratory Practice in the Testing of Chemicals. OECD Publication (59 82 04 1) ISBN 92-64 12367-9.

Acknowledgements

The original membership of the Special Advisory Committee on Carcinogens which included Dr. J. F. Mustard, Chairman of Council, Dr. E. Farber, (Banting Institute), Dr. A. B. Miller, (University of Toronto), Dr. D. R. McCalla, (McMaster University), Dr. J. E. Till, (Ontario Cancer Institute), was supplemented in February 1983 by two council members, Mr. R. T. Boldt and Mr. E. A. Waddell.

Council also wishes to acknowledge the valuable contribution made by all the unions, companies, associations and individuals who submitted briefs in response to the *Discussion Paper on the Control of Workplace Carcinogens*.

APPENDIX 1

IARC MONOGRAPHS SUPPLEMENT 4

Assessment of Evidence for Carcinogenicity From Studies in Experimental Animals

These assessments were classified into four groups:

i. Sufficient evidence of carcinogenicity, which indicates that there is an increased incidence of malignant tumours: (a) in multiple species or strains; or (b) in multiple experiments (preferably with different routes of administration or using different dose levels); or (c) to an unusual degree with regard to incidence, site or type of tumour, or age at onset. Additional evidence may be provided by data on dose-response effects, as well as information from short-term tests or on chemical structure.

ii. Limited evidence of carcinogenicity, which means that the data suggest a carcinogenic effect, but are limited because: (a) the studies involve a single species, strain, or experiment; or (b) the experiments are restricted by inadequate dosage levels, inadequate duration of exposure to the agent, inadequate period of follow-up, poor survival, too few animals, or inadequate reporting; or (c) the neoplasms produced often occur spontaneously and, in the past, have been difficult to classify as malignant by histological criteria alone (e.g., lung and liver tumours in mice).

iii. Inadequate evidence, which indicates that because of major qualitative or quantitative limitations, the studies cannot be interpreted as showing either the presence or absence of a carcinogenic effect; or that within the limits of the tests used, the chemical is not carcinogenic. The number of negative studies is small, since, in general, studies that show no effect are less likely to be published than those suggesting carcinogenicity.

iv. No data indicate that data were not available to the working group.

APPENDIX 2

Examples of tests that may be required for notification under section 21 of the Act.

a) Acute toxicity

Oral toxicity - rat
LD$_{50}$
Inhalation toxicity - rat
LD$_{50}$
Dermal toxicity - rabbit
LD$_{50}$ skin irritation
Eye irritation - rabbit
Dermal sensitivity (guinea pig or rabbit)

b) Sub acute toxicity - rat

c) Chronic toxicity

d) Mutagenicity

e) Pharmacokinetics

f) Carcinogenicity

g) Teratogenicity

APPENDIX 3

A TOXICOLOGY TESTING SCHEME FOR NEW CHEMICALS*

Table I

TIER 1

- Acute Toxicity
  - Oral Lethality (Rats)
  - Dermal Lethality (Rabbits)
  - Inhalation Lethality (Rats)** or 4-hour saturated vapour test**
- Eye Irritation (Rabbits)
- Skin Irritation (Rabbits)
- Skin Sensitization ***
- Initial Screening Tests for mutagenic/carcinogenic potential

TIER 2

- Subacute Toxicity
- 14 to 30-day Oral or Inhalation (Rats)
- Screening Tests for mutagenic/carcinogenic potential of chemicals

TIER 3

- Subchronic Toxicity 90-day, two species
- Reproduction Test
- Teratology - two species
- Pharmocokinetics and Metabolism Study
- Chronic Toxicity Carcinogenicity Study

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* Tables I and II were submitted to council in response to the discussion paper to illustrate Dow's procedures for testing new chemicals for mutagenicity and carcinogenicity.

** If there is significant exposure to gas or vapour.

*** If test compound is structurally similar to known skin sensitizers.

A TIER TESTING SYSTEM FOR IDENTIFYING CARCINOGENS

Table II

	Estimated Cost/Test
TIER 1	
Initial Screening Tests for Mutagenic/Carcinogenic Potential	$7,000
Salmonella typhimurium tester strains (Ames test) with and without metabolic activation	
Unscheduled DNA synthesis in rat hepatocytes	
TIER 2	
Screening Tests for Mutagenic/Carcinogenic Potential	$50,000 per test
In vivo cytogenetics (rats)	
Dominant lethal test (rats or mice)	
Micronucleus test	
TIER 3	
Long-Term Carcinogenicity Studies in Laboratory Animals (Two Species)	$800,000 to $1,100,000

INSTRUCTIONS AND EXPLANATION OF TERMS

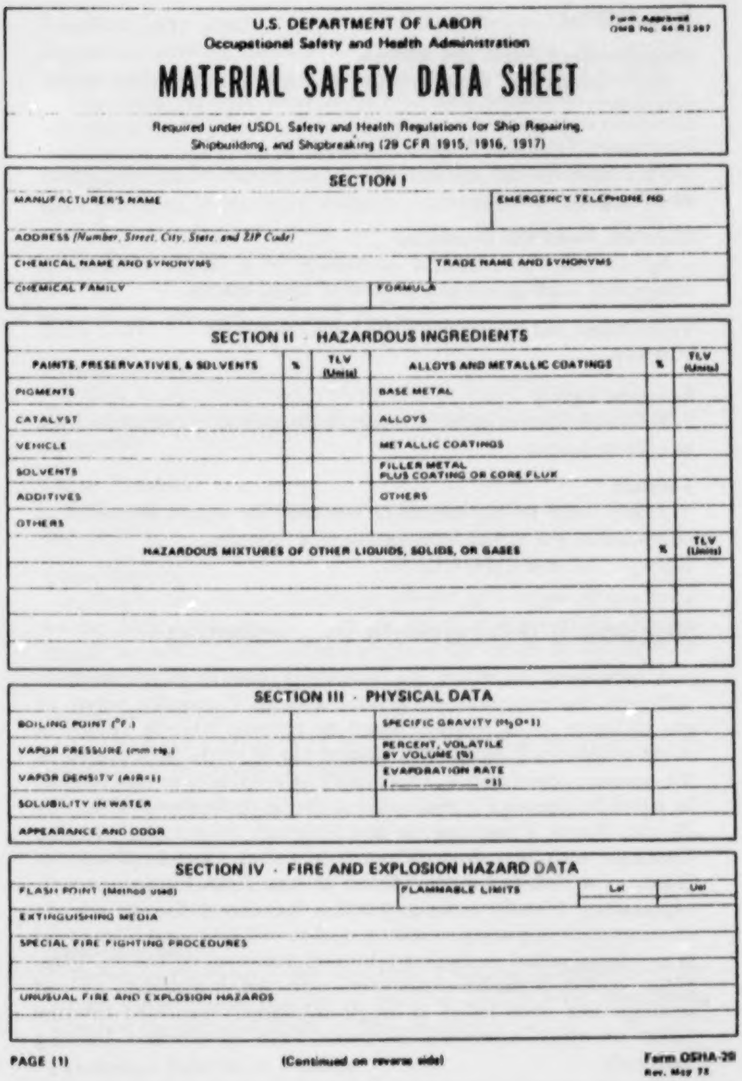
The Material Safety Data Sheet (Form OSHA-20), or one essentially similar, approved by OSHA, is required to be filled out only on materials which, when used without special precautions and controls, will constitute a health hazard to workers. Where information is not available from published sources or by normal test procedures, the fact shall be indicated by inserting the word "unknown." If information is inapplicable to the material under consideration, the initials "n.a." (not applicable) shall be inserted.

Essentially Similar Form

An essentially similar form is interpreted as being one in which Section II is modified to indicate only the product or group of products which it is intended to cover. The remaining sections of the form will list the items of information in the sequence shown on Form OSHA-20, but the space given to those entire sections which are inapplicable may be reduced to that necessary to enter the initials "n.a." (not applicable).

Hazardous Material

A hazardous material has one or more of the following characteristics: (1) has a flashpoint below 140°F., closed cup, or subject to spontaneous heating; (2) has a threshold limit value below 500 ppm for gases and vapors, below 500 Mg/M^3 for fumes, and below 25 mppcf for dusts; (3) a single dose oral LD$_{50}$ below 500 mg/kg; (4) is subject to polymerization with the release of large amounts of energy; (5) is a strong oxidizing or reducing agent; (6) causes first degree burns to skin in short time exposure, or is systemically toxic by skin contact; or (7) in the course of normal operations, may produce dusts, gases, fumes, vapors, mists, or smokes which have one or more of the above characteristics.



U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing,
Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO
ADDRESS *(Number, Street, City, State, and ZIP Code)*	
CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
CHEMICAL FAMILY	FORMULA

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)		SPECIFIC GRAVITY ($H_2O=1$)	
VAPOR PRESSURE (mm Hg.)		PERCENT, VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (________ =1)	
SOLUBILITY IN WATER			
APPEARANCE AND ODOR			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA			
SPECIAL FIRE FIGHTING PROCEDURES			
UNUSUAL FIRE AND EXPLOSION HAZARDS			

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Section I

Manufacturer's Name and Address
Self-explanatory. Give source of data if other than manufacturer.

Emergency Telephone Number
To obtain further information in the event of an emergency involving the material.

Chemical Name and Synonyms
Refers only to products consisting of a single element or compound, such as oxygen or methyl ethyl ketone.

Trade Name and Synonyms
If any.

Chemical Family
Refers to generic name of single elements and compounds, such as acid or ketone.

Formula
Refers only to the chemical formula for single elements or compounds, not to the formulation of a mixture.
Example: O_2 and $C_2H_5COCH_3$.

Section II (Hazardous Ingredients)

A hazardous ingredient is a hazardous material in a mixture in sufficient concentration to produce enough flammable vapor or gas to ignite or to produce acute or chronic adverse effects in doses which could result from normal use or predictable misuse of the mixture containing it. Ingredients of a hazardous nature shall be noted by chemical name in one of the three divisions of Section II, viz., Paints, Preservatives, and Solvents; Alloys and Metallic Coatings; and Hazardous Mixtures of Other Liquids, Solids, or Gases. The listing of ingredients in the first division is self-explanatory. Metallic coatings listed in the second division refer to coatings such as plating, cladding, and metallizing; and filler metal is any metal added in making a brazed, soldered, or welded joint. Filler metals shall be considered with the ingredients of rod coatings and core fluxes as single mixtures. The third division refers to other hazardous mixtures, such as abrasive blasting materials.

The approximate percentage of each hazardous ingredient by weight or volume shall be shown to the nearest 5 percent. The percentage of any substance constituting less than 5 percent may be indicated as such. For mixtures, such as filler metals and their coatings and core fluxes, in which the hazardous ingredients constitute very small proportions of the mixture, the hazardous ingredients shall be stated to the nearest 0.5 percent, and ingredients constituting less than 0.5 percent may be indicated as such.

The threshold limit value (TLV) for each hazardous ingredient in a mixture will be entered in the column provided, in accordance with instructions given in Section V.

If more space is needed in the first or second division, use the lines provided in the third division. Normally this space will be used for mixtures not falling in the other divisions. In addition, addenda sheets may be added to the form.

Section III (Physical Data)

Boiling Point

Refers to the temperature at which the liquid boils, in degrees F., at a pressure of 760 mm Hg. For mixtures, a boiling range is acceptable

Vapor Pressure

Refers to pressure of saturated vapor above the liquid in mm of Hg, at 20°C.

Vapor Density

Refers to the relative density or weight of a vapor or gas (with no air present) compared with an equal volume of air. Values should be given in the ambient temperature range of 60°-90°F. to facilitate field usage.

Solubility in Water

The following terms shall be used to describe the solubility of the product by weight in distilled water at 50°F.:

Negligible	less than 0.1 percent
Slight	0.1-1 percent
Moderate	1-10 percent
Appreciable	more than 10 percent
Complete	in all proportions

Specific Gravity

Refers to the ratio of the weight of a volume of material to the weight of an equal volume of water at 39.2°F. This determines whether the material floats or sinks in water.

Percentage Volatile by Volume

Refers to the percentage of the liquid or solid by volume that evaporates at the ambient temperature of 70°F.
This applies to solids such as Napthalene.

Evaporation Rate

Refers to whether the rate is greater or less than 1. Either Butyl

Acetate or Ether may be taken as unity. Insert the name of whichever is used.

Appearance and Odor

Give a brief description, e.g., viscous, colorless liquid with aromatic odor.

Section IV (Fire and Explosion Hazard Data)

Flash Point

Refers to the temperature in degrees F., at which a liquid will give off enough flammable vapor to ignite. The closed cup values shall be given. When multi-component paint systems are used and mixed in the field, the flash point of the individual components shall be noted.

Flammable or Explosive Limits

Refers to the range of gas or vapor concentrations (percent by volume in air) which will burn or explode if an ignition source is present. LEL means the lower explosive limit, and UEL means the upper explosive limit. Knowledge of the LEL will aid in determining the volume of ventilation needed for an enclosed space to prevent fires and explosions.

Extinguishing Media

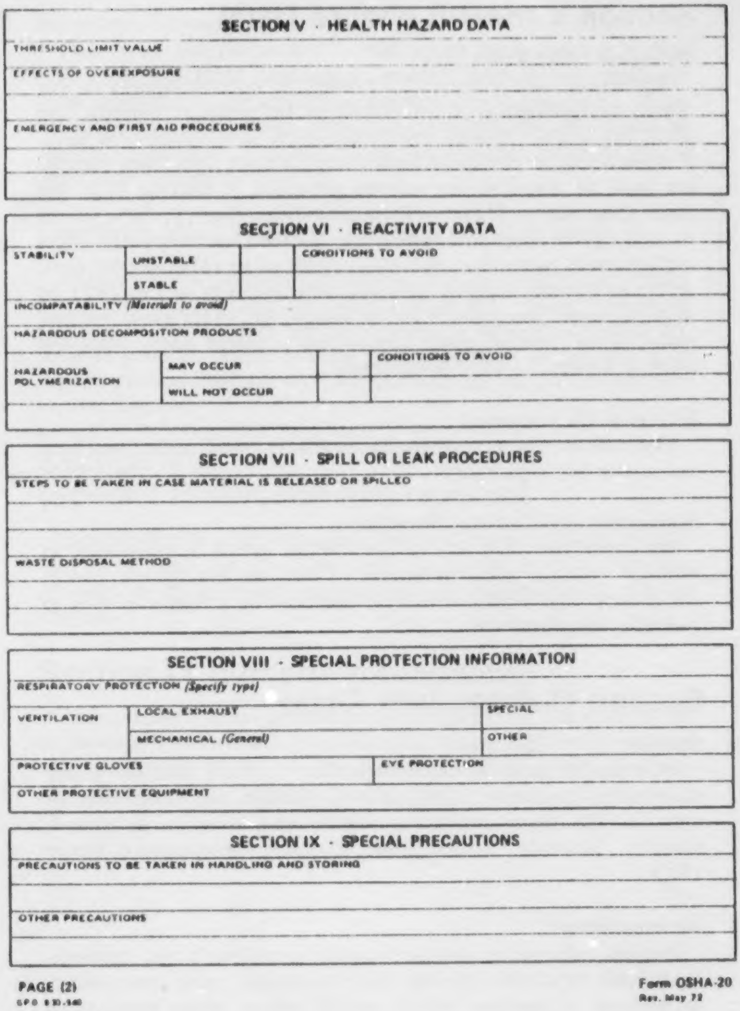
List the firefighting media suitable for use on the burning material. For certain specific chemical fires; special formulations, in addition to the standard agents, are available for extinguishing fires. These should be indicated by generic name. The standard firefighting agents are water fog, foam, alcohol foam, CO_2, and dry chemical.

Special Firefighting Procedures

If water is unsuitable, specify the firefighting media to be used. Also list any necessary personal protective equipment.

Unusual Fire and Explosion Hazards

Specify such hazards and/or any special conditions that govern them.



SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
EFFECTS OF OVEREXPOSURE
EMERGENCY AND FIRST AID PROCEDURES

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE		
INCOMPATABILITY *(Materials to avoid)*			
HAZARDOUS DECOMPOSITION PRODUCTS			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR		

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
WASTE DISPOSAL METHOD

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*		
VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER
PROTECTIVE GLOVES		EYE PROTECTION
OTHER PROTECTIVE EQUIPMENT		

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
OTHER PRECAUTIONS

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Section V (Health Hazard Data)

Threshold Limit Value

Threshold limit value (TLV) refers to current figures of the American Conference of Governmental Industrial Hygienists. The TLV for single elements and compounds shall be entered here. For mixtures, the threshold limit value for each significant ingredient shall be noted in the column provided in Section II of the form. (See Section II above for explanation.) Express these values in millions of particles per cubic foot of air (mppcf), or in milligrams of particulate per cubic meter of air (Mg/M^3) for dust; and in milligrams of particulate per cubic meter of air (Mg/M^3), or in parts per million parts of air by volume (ppm) for gases, vapors, mists, fumes, and all other contaminants except dusts. State the units in which the TLV is expressed.

Effects of Overexposure

Describe most common sensations that exposed person will feel, and his or her appearance.

Emergency and First-Aid Procedures

Only inhalation and skin or eye contact should be considered in recommending first-aid measures. These are emergency procedures only. The victim should be examined by a doctor as soon as possible after exposure.

Section VI (Reactivity Data)

Stability

Indicate, by cross or check, whether stable or unstable under reasonably foreseeable conditions of storage, use, or misuse. If unstable, list those conditions which may cause a dangerous reaction. Example: Shock from dropping; temperature above 150°F.

Incompatibility

Provide information on such common materials and contaminants with which the product may reasonably come into contact to produce a reaction which would release large amounts of energy. If none, so state.

Hazardous Decomposition Products

List hazardous materials produced in dangerous amounts by burning, oxidation, or by heating in welding or burning. Thermal decomposition products, such as CO, CO_2, and hydrochloric acid from vinyl chloride plastics are examples.

Hazardous Polymerization

Hazardous polymerization is that which takes place at a rate which releases large amounts of energy. Indicate by check or cross whether or not hazardous polymerization can occur. If so, list those reasonably foreseeable storage conditions which would start polymerization. Include the expected time period in which the inhibitors may be used up.

Section VII (Spill or Leak Procedures)

Indicate any applicable precautions such as: avoiding breathing gases and vapors; contact with liquids and solids; removing sources of ignition; any special equipment used for cleaning up, such as glass or plastic scoops; and disposal of spilled solids or liquids, such as flushing with water, returning material to container, burning, etc.

Section VIII (Special Protection Information)

Indicate the type of personal protective equipment and ventilation to be used and the precautions to be taken when using the product for its intended purpose, such as elimination of ignition sources.

Section IX (Special Precautions)

Indicate any special precautions to be taken, such as in handling or storing, to avoid reaction hazards. When applicable, indicate safe storage life of product in relation to reactivity. Also indicate any other general precautions to be taken.

APPENDIX A

TITLE 29—LABOR

CHAPTER XVII—OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION, DEPARTMENT OF LABOR

PART 1915 —SAFETY AND HEALTH REGULATIONS FOR SHIP REPAIRING

PART 1916 —SAFETY AND HEALTH REGULATIONS FOR SHIPBUILDING

PART 1917 —SAFETY AND HEALTH REGULATIONS FOR SHIPBREAKING

APPENDIX 5

New Occupational Safety and Health Administration (OSHA) Standard for Material Safety Data Sheets (MSDSs)

Submission to Federal Register
Workplace Hazard Communication
Subpart 1910 of Title 29 of the
Code of Federal Regulation (CFR)
amending s. 1910. 1200 (p..299-304)

(g) Material safety data sheets. (1) Chemical manufacturers and importers shall obtain or develop a material safety data sheet for each hazardous chemical they produce or import. Employers shall have a material safety data sheet for each hazardous chemical which they use.

(2) Each material safety data sheet shall be in English and shall contain at least the following information:

(i) The identity used on the label, and, except as provided for in paragraph (i) of this section on trade secrets:

(A) If the hazardous chemical is a single substance, its chemical and common name (s);

(B) If the hazardous chemical is a mixture which has been tested as a whole to determine its hazards, the chemical and common name(s) of the ingredients which contribute to these known hazards, and the common name(s) of the mixture itself; or,

(C) If the hazardous chemical is a mixture which has not been tested as a whole:

(1) The chemical and common name(s) of all ingredients which have been determined to be health hazards, and which comprise 1% or greater of the composition, except that chemicals identified as carcinogens under paragraph (d)(4) of this section shall be listed if the concentrations are 0.1% or greater; and,

(2) The chemical and common name(s) of all ingredients which have been determined to present a physical hazard when present in the mixture;

(ii) Physical and chemical characteristics of the hazardous chemical (such as vapor pressure, flash point);

(iii) The physical hazards of the hazardous chemical, including the potential for fire, explosion, and reactivity;

(iv) The health hazards of the hazardous chemical including signs and symptoms of exposure, and any medical conditions which are generally recognized as being aggravated by exposure to the chemical;

(v) The primary route(s) of entry;

(vi) The OSHA permissible exposure limit, ACGIH Threshold Limit Value, and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the material safety data sheet, where available;

(vii) Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Annual Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest editions), or by OSHA;

(viii) Any generally applicable precautions for safe handling and use which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, including appropriate hygienic practices, protective measures during repair and maintenance of contaminated equipment, and procedures for clean-up of spills and leaks;

(ix) Any generally applicable control measures which are known to the chemical manufacturer, importer or employer preparing the material safety data sheet, such as appropriate engineering controls, work practices, or personal protective equipment;

(x) Emergency and first aid procedures;

(xi) The date of preparation of the material safety data sheet or the last change to it; and,

(xii) The name, address and telephone number of the chemical manufacturer, importer, employer or other responsible party preparing or distributing the material safety data sheet, who can provide additional information on the hazardous chemical and appropriate emergency procedures, if necessary.

(3) If no relevant information is found for any given category on the material safety data sheet, the chemical manufacturer, importer or employer preparing the material safety data sheet shall mark it to indicate that no applicable information was found.

(4) Where complex mixtures have similar hazards and contents (i.e. the chemical ingredients are essentially the same, but the specific composition varies from mixture to mixture), the chemical manufacturer, importer or employer may prepare one material safety data sheet to apply to all of these similar mixtures.

(5) The chemical manufacturer, importer or employer preparing the material safety data sheet shall ensure that the information recorded accurately reflects the scientific evidence used in making the hazard determination If the chemical manufacturer, importer or employer becomes newly aware of any significant information regarding the hazards of a chemical, or ways to protect against the hazards, this new information shall be added to the material safety data sheet within three months. If the chemical is not currently being produced or imported the chemical manufacturer or importer shall add the information to the material safety data sheet before the chemical is introduced into the workplace again.

(6) Chemical manufacturers or importers shall ensure that distributors and manufacturing purchasers of hazardous chemicals are provided an appropriate material safety data sheet with their initial shipment, and with the first shipment after a material safety data sheet is updated. The chemical manufacturer or importer shall either provide material safety data sheets with the shipped containers or send them to the manufacturing purchaser prior to or at the time of the shipment. If the material safety data sheet is not provided with the shipment, the manufacturing purchaser shall obtain one from the chemical manufacturer, importer, or distributor as soon as possible.

(7) Distributors shall ensure that material safety data sheets, and updated information, are provided to other distributors and manufacturing purchasers of hazardous chemicals.

(8) The employer shall maintain copies of the required material safety data sheets for each hazardous chemical in the workplace, and shall ensure that they are readily accessible during each work shift to employees when they are in their work area (s).

(9) Material safety data sheets may be kept in any form, including operating procedures, and may be designed to cover groups of hazardous chemicals in a work area where it may be

more appropriate to address the hazards of a process rather than individual hazardous chemicals. However, the employer shall ensure that in all cases the required information is provided for each hazardous chemical, and is readily accessible during each work shift to employees when they are in in their work area(s).

(10) Material safety data sheets shall also be made readily available, upon request, to designated representatives and to the Assistant Secretary, in accordance with the requirements of 29 CFR 1910.20 (e). The Director shall also be given access to material safety data sheets in the same manner.

(h) Employee information and training. Employers shall provide employees with information and training on hazardous chemicals in their work area at the time of their initial assignment, and whenever a new hazard is introduced into their work area.

(1) Information Employees shall be informed of:

(i) The requirements of this section;

(ii) Any operations in their work area where hazardous chemicals are present; and,

(iii) The location and availability of the written hazard communication program, including the required list(s) of hazardous chemicals, and material safety data sheets required by this section.

APPENDIX 6

ACOHOS Memo # 80-IV Concerning Policies and Principles for the use of Information in the Prevention of Occupational Accidents and Illnesses

ACOHOS Recommendations

29. that the Minister of Labour, in collaboration with other ministers, take the steps necessary to develop a unique personal identifier, other than the Social Insurance Number, to facilitate the linkage of all records relevant to occupational health and safety. Until such time as a unique personal identifier of this sort has been developed and coded on records so as to enable epidemiological studies to be conducted through the use of this new identifier alone, the minister should encourage the use of SIN as a unique personal identifier.

30. that the Minister of Labour ensure that all Ministry of Labour and Workmen's Compensation Board files containing information on a worker's occupational disease claims and medical history contain a unique personal identifier. In addition, the minister should require that all records of exposure to carcinogenic and toxic agents kept pursuant to the *Occupational Health and Safety Act* and regulations should include a unique personal identifier.

Minister of Labour's Response

The Government of Ontario has recognized the need for regulating the use of Social Insurance Numbers within the provincial government. In response to the recommendations of the *Report of the Commission of Inquiry Into the Confidentiality of Health Information*, the Province intends to implement policy guidelines on June 30, 1981 restricting the use of SIN to income-related files and, for a limited time, to medical data banks.

In accordance with this policy, the Ministry of Labour will be reviewing the use of Social Insurance Numbers in the ministry. As well, the minister will consult with the Minister of Health regarding the feasibility of developing a unique personal identifier. The ministry recognizes the need for a common identifier to facilitate record linkage in the field of occupational health and safety.

Action Taken

A copy of memorandum 80-IV was sent to the Minister of Health to review and comment. The Minister of Health passed the memorandum to the Information Systems Division regarding the development of a unique personal identifier. Their review will be carried out within the context of that ministry's review of the *Report of the Commission of Inquiry Into the Confidentiality of Health Information*. The result of their review will be forwarded to this ministry.

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Minister

Ministry
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April 19, 1984.

Dr. D. R. McCalla,
Chairman,
Advisory Council on Occupational
Health and Safety,
400 University Avenue,
Toronto, Ontario,
M7A 1T7.

Dear Dr. McCalla:

Thank you for your letter of March 23, 1984 submitting to me Advisory Memorandum 83-IV on "New Chemical and Biological Agents in the Workplace: Identification and Control of Carcinogens and Potential Carcinogens".

As you indicate in your letter, the problem addressed by the memorandum is a complex one and the Advisory Council has had to consider many factors and submissions from labour, management and professional groups. The memorandum is under study by my officials and I will forward a final reply to the Council's advice on this important issue within the near future.

Please extend my thanks to Council members and Task Force members who worked so diligently on this memorandum.

Yours sincerely,

R. H. Ramsay,
Minister.

Follow-up Correspondence to Previous Advisory Memorandum 82-VI

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May 12, 1983.

J. Fraser Mustard, M.D.,
Chairman,
Advisory Council on Occupational Health
and Occupational Safety,
15th floor,
400 University Avenue,
Toronto, Ontario,
M7A 1T7.

Dear Dr. Mustard:

Thank you for your letter of May 10 responding to my request for clarification of recommendations 82-10 and 82-11 contained in Memorandum 82-VI.

Your letter indicates, in clear language, that Council's intention was to recommend that the Ministry introduce a mandatory requirement that employers offer alternative work, if available, within their organizations, to pregnant VDU operators for the duration of their pregnancies. I take the phrase "mandatory requirement" to be equivalent to a statutory obligation.

These recommendations, as well as the others contained in the Memorandum, will be carefully assessed by the Ministry's staff. However, I am still unclear on a matter which seems to be of fundamental importance.

In Dr. Elgie's letter to you dated April 23, 1981, he invited Council to form a "technical committee to review the evidence pertaining to the various implications for health associated with the use of the video display terminals." This request was made, as Dr. Elgie observed, due to the fact that "some workers using these terminals and their employers continue to doubt the safety of working with video display terminals, especially where a pregnant woman is involved." Your letter of May 10 is helpful, as far as it goes, but I am still unclear as to whether the recommendations contained in Council's Advisory Memorandum are premised on a positive finding that VDTs are injurious to the health of pregnant employees, to the fetus, or to both. Until a definitive reply is provided to this threshhold question, it is difficult for me to assess the various policy options to which Council has referred.

Please accept my assurance that I have no wish to prolong this exchange of correspondence with Council. However, I know you will appreciate the reason for this further and, I would hope, final request for advice, on a matter of fundamental importance in our consideration of this important issue. In preparing your response, you might address one additional point that I raised in my letter of March 9: namely, whether there are any supporting documents developed by or for the task force which might be of assistance to my officials in their deliberations.

I appreciate Council's co-operation in this difficult assignment.

Yours sincerely,

R. H. Ramsay,
Minister.

Ontario

Advisory Council on
Occupational Health &,
Occupational Safety

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416/965-2448

September 9, 1983

The Honourable R. H. Ramsay
Minister of Labour
400 University Avenue
14th Floor
TORONTO, Ontario
M7A 1T7

Dear Mr. Ramsay:

In your letter of May 12, 1983, you asked whether the recommendations contained in council's Advisory Memorandum 82-VI are premised on a positive finding that VDUs are injurious to the health of pregnant employees, to the fetus, or to both. Council has further reviewed the scientific evidence relating to both possible radiation emissions from VDUs and the potential biological effects which can result from exposure to electromagnetic emissions from VDUs, including new data not available at the time council made its recommendations.

In respect to ionizing radiation, council stated in its memorandum that 'based on existing scientific evidence, it is unlikely that X-ray emissions from VDUs present any measurable health hazard to the operator or to the fetus in the case of a pregnant woman.' Council wishes to reaffirm, therefore, that there is no evidence of a health hazard from ionizing radiation from properly designed, manufactured and maintained machines. The same statement can be made in relation to non-ionizing radiation in the infrared, ultraviolet and microwave frequency ranges of the electromagnetic spectrum.

In terms of low frequency radiation, council stated 'While there is, at present, no scientific evidence to link reported health effects among human populations to exposure to radio frequency fields generated by VDUs, there are gaps and inconsistencies in our knowledge in this area, particularly in relation to the possible health effects of electrostatic, extremely low frequency fields and very low frequency modulated radio frequency fields.' Because of the concerns frequently expressed regarding the potential biological effects of low frequency pulsed fields, council gave this area special consideration. A memorandum to council, prepared by Dr. Stopps, chairman of the Task Force on the Possible Health Hazards of Visual Display Units, discusses this issue in further detail, and is attached as Appendix A. I should stress that this memorandum represents Dr. Stopps's views and not necessarily those of the Advisory Council members. In addition, council has reviewed a table prepared by council staff summarizing the field strength measurements over different frequency ranges in the area of controversy made by several major studies of the electromagnetic spectrum associated with VDUs (Appendix B). It is council's conclusion that, although these concerns have not been completely resolved, there appears to be no evidence of a reproductive hazard to VDU operators from low frequency radiation emissions from VDUs.

Another source of evidence considered by council was the epidemiological data, which took into account not only possible radiation emissions but also other environmental factors. In addition to the epidemiological studies referred to in the advisory memorandum, council also reviewed the general survey of health complaints of VDU operators conducted by the Canadian Labour Congress in 1982. As stated in the advisory memorandum, however, the available evidence is inconclusive and the quality and size of the data base is inadequate to firmly conclude on the basis of epidemiological data alone whether there is or is not an adverse reproductive effect.

In reviewing, therefore, both the evidence concerning potential health effects of radiation emissions from VDUs and the epidemiological data relating to possible reproductive hazards to pregnant operators, council is of the opinion that there is no scientific evidence of a positive hazard to the pregnant operator, to the fetus, or to both. It should be pointed out, however, that the Task Force on the Possible Health Hazards of Visual Display Units has not yet completed its review of the ergonomic and other problems associated with VDUs that may produce adverse health effects.

I hope that this review of council's assessment of the scientific evidence answers the question that you posed in your letter. The rationale for council's recommendation is, of course, set out in Advisory Memorandum 82-VI.

Yours very truly,

J. F. Mustard, M.D.
Chairman

Attachments

cc to: T. E. Armstrong, QC
Dr. A. E. Robinson
Mr. Brian Goodman

Ontario

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APPENDIX A

August 18, 1983

MEMORANDUM TO: Members of the Advisory Council on Occupational Health and Occupational Safety

FROM: Dr. G. Stopps, Chairman
Task Force on the Possible Health Hazards of Visual Display Units

RE: Electromagnetic Spectrum From VDUs

Pulsed Electromagnetic Fields

Except for very rare situations, persons exposed to electromagnetic fields are not exposed to steady fields of unvarying field strength but are exposed to a modulated intensity which, over a period of time, usually follows a regular pattern. The most common example of such a regularly modulated field is that surrounding wiring in a house supplied with 60 Hz current.

The intensity of such a modulated field is usually expressed by some form of averaging formula such as root mean square (RMS) or the simple average of the peak-to-peak strength. Such techniques are adequate methods for expressing the strength of the fields for most purposes but they do not accurately describe the highest fields experienced (the 'peak height').

This theoretical inadequacy in describing the field strength is compounded as the modulations move from the commonly encountered sine wave form of ordinary 60 Hz house current towards very abrupt changes of wave form as may be found in television circuits or around fluorescent lighting fixtures. Under these conditions of very swiftly changing intensity, ordinary testing equipment may not follow the changes rapidly enough and the peak field strength may be underestimated by factors of 10 to 100.

To accurately measure the abrupt changes in field strength found at certain frequencies arounds VDTs, fairly sophisticated equipment is required, such as that used in the study of VDTs by Ontario Hydro.[1] In this study, using one machine, it was found that the flyback transformer circuitry was responsible for true peak field strengths up to 1385 V/M. These values were not found at the operators' position but were to one side of the rear of the set. This means that in certain configurations of office layout, another VDT operator or member of the office staff may be in an area in which very short duration pulses of high field strength may be experienced.

Few of the great number of publications reporting the radiation fields around VDTs have addressed the question of pulsed fields although there is general agreement in such reports that ionizing radiation (X-rays) is not present at levels that give cause for concern over any health hazard. These reports (which have been recently summarized)[2] also agree that microwave radiation is not produced by VDTs.

The Biological Significance of Pulsed Radiation

Having established that low frequency (approximately 16 kHz) pulsed electrical fields may exist around VDTs, the next question related to their biological significance. There are theoretical grounds as well as experimental observations that suggest that pulsed or interrupted fields may have different biological effects from non-pulsed or continuous fields.

Firstly, there are several scientific papers which lay a theoretical groundwork for this interaction of relatively weak electromagnetic fields with biological systems.[3] These papers consider the cells of the body and, particularly, the cells of the brain, as exhibiting many of the characteristics of solid state electronic devices. Such a concept would help to explain how quite low field strengths might influence cell metabolism through an amplification mechanism involving the cell membrane. The electrical characteristics of the cell membrane are such that it may act as a low pass filter, thus making the intensity and frequency of the electromagnetic field very important in the production of biological effects. Thus, on theoretical grounds, effects may be found within narrow ranges of frequency and field intensity but these effects could be absent at higher or lower values.

There are also a number of scientific studies which indicate that pulsed fields do have biological effects which differ from non-pulsed fields.[4] Most of these experiments are at higher field strengths than are found within 30 cm of a VDT. Few experiments have been done at lower fields strengths but where such experiments have been carried out some effects have been found.[5] The implications of these effects for human health are not clear.

The question of what constitutes an effect and what constitutes a hazard to human health involves value judgments. Such value judgments are likely to produce conflicting viewpoints over the health significance of extremely low frequency electromagnetic fields measured around a VDT, but what is known is that inexpensive shielding of the VDT, and in particular the flyback transformer, can dramatically reduce the field intensity to below the 0.07 V/M suggested as a safe level by the U.S. National Academy of Sciences.[6]

There appear to be sound scientific grounds, therefore, for the task force recommendation on screening based on the grounds of safety, health and reduction in electromagnetic interferences.

It should be stressed that simple comparisons of the average field intensity of electromagnetic radiation associated with VDTs and various domestic appliances, such as hair dryers, refrigerators and electric drills, may not be appropriate when considering pulsed fields, because of the need for special measuring techniques to document any pulsed fields that may be produced.

1. Harvey, S.M., 'Characteristics of Low Frequency Electrostatic and Electromagnetic Fields Produced by Video Display Terminals.' Ontario Hydro Research Division, Report No. 82-528-K, December 1982.

2. 'Video Displays, Work and Vision' - Panel on Impact of Video Viewing on Vision of Viewers, National Research Council, National Academy Press, Washington, D.C., 1983.

   'Investigation of Radiation Emissions from Video Display Terminals', Health and Welfare, Canada, 1983. 'An Evaluation of Radiation Emissions from Video Display Terminals, U.S. Dept. of Health and Human Services, Bureau of Radiological Health, F.D.A. 81-8153 (Feb. 1981).

3. 'Biological Effects of Non-ionizing Electromagnetic Fields - A Hypothetical Model', J. Juutilainen - Proceedings of the Finnish-Soviet Symposium on Environment and Health Publications of the University of Kuopio, Kuopio, Finland 1982.

4. 'The Case for Concern About Very Low Frequency Field From Visual Display Terminals: The Need for Further Research and Shielding of VDTs', Marha, K., Spinner, B., Purdham, J., Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, 1983.

5. 'Effects of Electromagnetic Stimuli on Bone and Bone Cells In Vitro: Inhibition of Responses to Parathyroid Hormone by Low-Energy, Low-Frequency Fields', Adey, W.R., et al, Proceedings of National Academy of Sciences, Vol. 97(1982), p.4180, 4184.

6. 'Effects of High Voltage Pulses on the Viability of Human Leucocytes In Vitro', Hansson Mild, K., Loudahl, L., Loustrand, K.G. and Loustrup, S., Bioelectromagnetics 3: 213-218 (1982)

APPENDIX B

Maximum Values in R.F. Range Reported from Radiation Measurement Studies (Electric Field Strength in volts per metre — V/m)

Frequency	*NIOSH Moss et al (1977)*	*Wolbarsht et al (1980)*	*Terrana et al (1980)*	*HSE NRPB (Cox — 1980)*	*NIOSH (1981)*	*BRH (1981)*	*Hydro-Harvey (1982)*	*Health and Welfare Canada (1983)*
				NRPB 300 MHz–18 GHz approx 3.7 V/m at surface				
10 GHz				10 MHz– 3 GHz approx 106.4 V/m at surface				
300 GHz	10-500 MHz Not detectable 10 cm from surface	10 MHz–10 GHz 5.2 mV/m at 25 cm	100 kHz– 500 MHz 3.6 V/m at top surface 0.5 V/m operator position			*BRH* 10 kHz–100 MHz >64 V/m 5 cm from CRT 2.4 V/m 30 cm from CRT		
10 MHz				10 kHz–200 MHz >300 V/m 10 cm from surface	10 kHz–300 MHz Not detectable 5 cm from all surfaces		*indicates highest pulsed value	10 kHz–220 MHz >492 V/m at surface 4.5 V/m at keyboard 4.4 V/m 30 cm from CRT
30 kHz		1 kHz–10 MHz 0.23 V/m at 25 cm		*HSE* 1000 V/m at surface at approx. 150 kHz		*WEAC* 300 V/m 2" from surface 270 V/m 12" from surface		
10 kHz							– 1.7 V/m pulse peak amplitude at 16 kHz pulse repetition rate – rms amplitude 0.3 V/m – 1385 V/m 30 cm* from back of set.	
d.c.								

APPENDIX B (continued)
Biological Effects at Extremely Low Frequencies and Low Field Intensities

'Initial observations indicated that EM fields imposed on brain tissue at levels of the EEG and oscillating sinusoidally at frequencies of the EEG spectrum (1–100 Hz) induce significant changes in ionic electrochemistry, in the electrophysiological rythms of the EEG and in certain learned patterns of EEG responses.' (Adey, R.A. 'Biological Effects of Low Energy Electromagnetic Fields on the Central Nervous System', in *Biological Effects and Dosimetry of Non-ionizing Radiation*; Grandolfo, M., Michaelson, S.M., and Rindi, A., eds. Plenum Press, New York, 1983.)

Decreased calcuim efflux in mammalian brain tissue at 16Hz (maximum effect) with threshold of 10 V/m sinusoidal electric field. (Bawin, S.M. and Adey, R.A., 'Sensitivity to Calcium Binding in Cerebral Tissue to Weak Environment Electric Fields Oscillating at Low Frequency', *Proc. Natl. Acad. Sci.*, U.S.A., 73:1999-2003 (1976)).

Shortened subjective time estimation in monkeys by 5–10%, maximum effect at 7 Hz and 10 V/m. (Gavalas-Medici, R., Walter, D.O., Hamer, J. and Adey, W.R., 'Effect of Low Level, Low Frequency, Electric Fields on EEG and Behaviours in *Macaca-nemestrina*', *Brain Res.* 18:256-258 (1970); Gavalas-Medici, R., and Day-Magdaleno, S., 'Extremely Low Frequency, Weak Electric Effect Schedule-Controlled Behaviour in Monkeys', *Nature*, London, 261:256-258, (1976)).

Reaction times in humans slowed at times of high natural activity in environmental ELF fields: 3-6 Hz and 0.5-5.0 V/m (Konig, H.L., 'Behavioural Changes in Human Subjects Associated With ELF Electric Fields' in *'ELF and VLF Electromagnetic Fields Effects'*, Persinger, M.A., ed., Plenum Press, New York, 81-99 (1974)).

Shortened circadian rhythms in humans using 10 Hz, 2.5 V/m square wave (pulsed) field. (Wever, R., 'ELF — Effects on Human Circadian Rhythms' in 'ELF and VLF Electro-magnetic Field Effects', Persinger, M.A., ed., Plenum Press, New York, 101-144 (1974); see also 'Wever, R., 'Effects of Low-Level, Low-Frequency Fields on Human Circadian Rhythms', in *Neuro Sci. Res. Program Bull.*, 15:39-45 (1977)).

For more general papers, see also: Adey, W.R., 'Some Fundamental Aspects of Biological Effects of Extremely Low Frequency (ELF)', in Biological Effects and Dosimetry of Non-ionizing Radiation, op. cit.; Juutilaimen, J. 'Biological Effects of Non-ionizing Fields: A Hypothetical Model', Proceedings of the Finnish-Soviet Symposium on Environment and Health, University of Kuopio, Nov. 25-27, (1980); Lemer, E.J., 'Radio-Frequency Radiation: Biological Effects', IEEE Spectrum, Dec. 1980, 51-59; McRee, D.I., *et al*. Effects of Non-ionizing Radiation on the Central Nervous System, Behavior and Blood: A Progress Report'. *Environmental Health Perspectives*, vol. 30, June 1979, 123-131.

References for Radiation Studies in Appendix B

Moss, C.E., *et al.*, 'A Report on Electromagnetic Radiation Surveys of Video Display Terminals,' DHEW (NIOSH) Publication no. 78-129, Cincinnati: NIOSH 1978.

Wolbarsht, M.L., *et al.*, 'Electromagnetic Emission from Visual Display Units: a Non-Hazard.' In: Ocular Effects on Non-Ionizing Radiation. Bellingham: Society of Photo-Optical Instrumentation Engineers, 1980.

Terrana, T., *et al.*, 'Electromagnetic Radiations Emitted by Visual Display Units,' In: Grandjean, E. and Vigliani, E., Ergonomic Aspects of Visual Display Units. London: Taylor and Francis, 1980.

Cox, E.A., 'Radiation Emissions from Visual Display Units,' *in* 'Health Hazards of VDUs?' Paper presented at a One Day Conference at Loughborough University, Thursday, 11th December, 1980.

Murray, W.H., *et al.*, 'Potential Health Hazards of Video Display Terminals,' DHEW (NIOSH) Publication no. 81-129, Cincinnati: NIOSH 1981.

'An Evaluation of Radiation Emission from Video Display Terminals,' HHS Publication FDA 81-8153, Bureau of Radiologic Health, U.S. Dept. of Health and Human Services, 1980.

Harvey, S.M., Characteristics of Low Frequency Electrostatic and Electromagnetic Fields Produced by Video Display Terminals.' Ontario Hydro Research Division, Report No. 82-528-K, December 1982.

Investigation of Radiation Emissions from Video Display Terminals, Health and Welfare, Canada, 1983.

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October 11, 1983

J. Fraser Mustard, M.D.,
Chairman,
Advisory Council on
Occupational Health
and Occupational Safety,
15th floor
400 University Avenue,
Toronto, Ontario.
M7A 1T7

Dear Dr. Mustard:

Thank you for your letter dated September 9, 1983, in which you responded to my request to further clarify the basis for the recommendations contained in Advisory Memorandum 82-VI on video display units (VDUs).

My officials have now had an opportunity to review this letter and the accompanying appendices, in conjunction with previous correspondence and the formal advice set out in the advisory memorandum.

I appreciate that many of the recommendations contained in the memorandum were formulated in the light of the scientific uncertainty that existed when the advisory memorandum was drafted. I am pleased to note from your most recent letter that much of this uncertainty has now been removed.

I was reassured to note that Council has reaffirmed its earlier position that "there is no evidence of a health hazard from ionizing radiation from properly designed, manufactured and maintained machines". Furthermore, Council has reasserted that "the same statement can be made in relation to non-ionizing radiation in the infrared, ultraviolet and microwave frequency ranges of the electromagnetic spectrum". In the September 9 letter, Council also advises, based on a review of the scientific literature and several radiation surveys (some of which were not published when the advisory memorandum was completed), that there appears to be no evidence of a reproductive hazard to VDU operators from low-frequency (non-ionizing) radiation emissions from these units. The Advisory Council's overall conclusion is that "there is no scientific evidence of a positive hazard (from VDU emissions) to the pregnant operator, to the fetus or to both".

... 2

I understand that Council's basic conclusions are consistent with the results obtained in a recent survey conducted by Health and Welfare Canada. I am informed that this report presents the results of testing carried out on 227 VDUs. In all, 122 different types of units were examined. The tests measured emissions throughout the electromagnetic spectrum from x-rays to extremely low frequency emissions. The report contains the most detailed information released to date on the various types of radiation produced by VDUs. The authors conclude that there is no danger posed by the "miniscule" amounts of radiation emitted by these units. I understand that the findings of this survey have recently been endorsed by the Canadian Medical Association.

Based on a review of Council's most recent letter which indicates that there has not been a positive finding that VDUs are injurious to the health of pregnant operators or to the fetus, and that any lingering uncertainty in this area has been reduced as a result of new scientific research, and after considering the advice provided by my own officials, I question the need for the majority of the recommendations contained in Council's advisory memorandum. Since tests conducted on VDUs both in Ontario and elsewhere have shown consistently that the levels of radiation emitted are negligible and often below the limits of detection, Council's recommendations concerning the requirements for pre-market and periodic testing of VDUs, the labelling of these units, and shielding would appear to be difficult to justify, if Council had in mind a legislative approach. Similarly, since there has not been a positive finding that work on VDUs has an adverse effect on reproductive outcomes, Council's recommendations pertaining to the transfer of pregnant operators to alternative work appear not to be justified on the basis of the available scientific evidence.

Simply because some employers have agreed to allow pregnant operators the option of a transfer to alternative work in response to what Council has termed "a genuinely held concern about a specific health effect of VDUs", is insufficient reason for the Government to require all employers to offer alternative work, without financial penalty, in the absence of any evidence that a health hazard exists. In fact, if the Government were to implement this recommendation, some would no doubt argue that this would further contribute to the notion that positive evidence of a health hazard exists, when Council concedes that this is not the case.

With respect to Council's recommendation that the Ministry support well-designed health effects studies to investigate the possible association of working with VDUs and abnormal reproductive function, I wish to point out that the Ministry has discussed this matter with other government agencies. Since this issue transcends provincial boundaries

... 3

a more useful study could be conducted on a national basis. I understand that such a study is under consideration at the Federal level, and should one proceed, we will of course offer every assistance. Should the Federal initiative not go forward, I will further consider this recommendation.

These units are probably the most visible element of the changing office environment, brought about by advances in high technology. I am firmly of the view that much of the understandable concern on the part of operators and potential operators surrounding VDUs has resulted from the failure by employers to consult with and provide adequate information to these persons before these units were introduced into the workplace.

Due to the considerable interest and concern expressed by members of the public on the possible health effects associated with the use of VDUs, the Ministry intends to publish a pamphlet on video display units as an aid to interested parties.

To conclude, I wish to emphasize that, while the Ministry did not consider the available scientific evidence to be sufficiently strong to warrant regulatory action, my officials will continue to monitor the results of relevant studies, so that early action may be taken in the event that evidence of a hazard to health is revealed.

I wish to thank the Advisory Council for the attention it has given to this issue, and look forward to receiving Council's advice on the ergonomic aspects of work on video display units.

Yours sincerely,

R. H. Ramsay,
Minister.

Follow-up Correspondence to Previous Advisory Memorandum 82-VII

Office of the
Minister

Ministry
of
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400 University Avenue
Toronto, Ontario
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(416) 965-4101

May 18, 1983

J.F. Mustard, M.D.,
Chairman,
Advisory Council on Occupational
Health and Safety,
15th floor,
400 University Avenue,
Toronto, Ontario.
M7A 1T7

Dear Dr. Mustard:

Further to my letter of May 4, I have now had an opportunity to consider with senior Ministry officials the contents of Advisory Memorandum 82-VII concerning legal interpretations under the Occupational Health and Safety Act.

Council recognizes in the Introduction to its memorandum that the Ministry of Labour is, of necessity, required to offer guidance on the interpretation of certain provisions of the Act to assist its inspectors and other operational personnel in the application and administration of the legislation. It is acknowledged that, although the Ministry's Guidelines have no binding legal status, they function as working interpretations of the Act until subject to challenge. While it is true that case law interpreting the statute is still limited, there does exist a well developed body of case law dealing with the principles of statutory construction, and as you may know, a number of legal texts and articles have been written on the subject. In the absence of any case law on the very section on which an interpretation is sought then, it is to these rules of statutory construction as set forth in this Province's Interpretation Act, and as applied by adjudicative tribunals faced with similar questions, that Ministry legal staff look. That being so, I must confess that I have some difficulty in understanding Council's admonition at the conclusion of the Introduction that "any Guidelines for the interpretation of the statute formulated by the Ministry's Legal Branch should be broad and flexible enough to encompass future developments and changes of attitude". With respect, it is not open for those in charge of administering the statute to depart from well-established principles of statutory construction laid down by the Courts.

... 2

The fact is that Ministry legal staff make every effort to interpret the Act so as to best ensure its objective: namely, the protection of the health and safety of the workers covered by the statute. Nonetheless, it does happen that interpretations are occasionally urged upon the Ministry which, on any construction, the sections simply cannot bear in the opinion of Ministry legal staff. Any legal opinion so formed is not binding, and may be challenged in the Courts in a prosecution or in an application for judicial review, and also in any hearing before the Ontario Labour Relations Board on a complaint arising under Section 24.

I now turn to the comments and recommendations contained in the second part of the memorandum, dealing with the right to refuse unsafe work. It seems to me that the physical condition of a workplace does not have any reference to or involve the condition of a fellow worker. I understand that this issue was carefully considered by the Standing Committee on Resources Development of the Legislature, with the result that the present language in Section 23(3)(b) was adopted. The degree of competence, experience, fatigue and the influence of alcohol or of a drug, etc., are not easy matters to determine. In some instances questions of a medical nature may be involved, while in others the questions are of a subjective nature. Undoubtedly, these difficulties played some part in the consideration of the Standing Committee.

Once the condition of a fellow worker however is responsible for some effect upon the physical condition of the workplace, such that there is likely to be a danger, a worker may refuse to work. For example, while the right to refuse may not be taken where a worker believes his co-worker to be incompetent, once that incompetence is manifested in the physical condition of the workplace, the right to refuse would exist; for example where the co-worker leaves his tools scattered on the floor of the work area, such that they constitute a danger.

In conclusion then, I am able to accept Recommendation 82-12 insofar as the "hazardous situation" has some effect upon the physical condition of the workplace. In fact, it is my understanding that Section 23(3)(b) is presently interpreted in this fashion. I am unable to accept that Section 23 has application where the hazard is the fellow worker himself or herself. This does not mean that there is no remedy where the condition of a fellow worker is considered hazardous. The employer (s.14(2)(g)) and supervisor (s.16(2)(c)) are obliged by the Act to take every precaution reasonable in the circumstances for the protection of a worker. For his part, the worker is required by s.17(1)(d) to report to his employer or supervisor the existence of any hazard of which he knows. Where an allegation of incompetence, etc. is made then, the employer or supervisor

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must enquire and take appropriate action. This approach appears to me to be more suited to the circumstances than to interpret Section 23(3)(b) in a manner that the section simply cannot bear; i.e. where there has been no effect upon the physical condition of the workplace such that there is likely to be danger.

As to Recommendation 82-13, Ministry legal staff have never, to my knowledge, taken the view that maintenance workers or repairers of equipment are excluded from the right to refuse unsafe work. As you know, Sections 23(1) and (2) set forth the exclusions and limitations to the Section, and none of these exclusions and limitations include maintenance or repair workers. However, I do not read Council as suggesting that repair and maintenance workers should have the right to refuse where the very equipment to be repaired or maintained constitutes a danger. The result of such a construction, of course, could conceivably bring repair and maintenance work to a standstill, such that rendering equipment safe would be impossible. Repair and maintenance workers could however refuse to work where for example the tools used to repair the defective equipment constituted a danger, or the physical condition of the workplace was hazardous.

Neither maintenance nor repair workers are excluded from the prohibition upon workers contained in Section 17(2)(b) for similar reasons. It is possible to repair broken or damaged equipment by taking precautions against dangers, and there are sections in the regulations which deal specifically with precautions to be taken.

As to Recommendation 82-14, the suggestion is made that a worker who is fatigued or unwell, who fears confined space, or who lacks training or experience in performing a task, be obliged to refuse to work if he believes he would be creating a hazard for himself or other workers.

This Recommendation is related to Recommendation 82-12 and is the converse situation. Whereas 82-12 dealt with the exercise of the right of a worker to refuse work in the case of a hazard believed to be created by another worker who was fatigued or unwell, etc., 82-14 would apply the right to refuse work to the worker who was fatigued or unwell, etc., as well, and place a duty upon him to do so.

Clause 17(2)(b) is a statutory statement of the duty placed upon a worker to operate equipment with care and to work safely so as to avoid personal injury or injury to other workers. The Clause applies in the illustrations given where the worker's condition is such that his use or operation of equipment or his manner of working is a hazard. Accordingly, that part of the Recommendation is present policy in the Act. This being so, I do not perceive any need to confer upon the worker a right to refuse to work in such circumstances. His duty is to work safely, and a breach of the duty is a violation of the Act.

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Let me now turn to Council's comments on page 4 of the memorandum on the issue of distribution by the Ministry of legal interpretations under the Act. I thought it might be helpful if I were to begin by providing a brief synopsis of how the Ministry came to make summaries of its legal interpretations available on request.

To my knowledge, it is not common practice for a Government Ministry to provide to members of the public legal interpretations made by Ministry lawyers, as distinguished from decisions reached by adjudicative tribunals, such as the Ontario Labour Relations Board. This may be accounted for, in part, by the fact that the interpretations are merely legal opinions, as opposed to decisions of courts or tribunals which would bind the parties, and in part that legal advice is privileged information.

However, as a result of requests received from certain trade unions, the Ministry took the unique step of making available summaries, updated twice yearly, of certain sections of the Occupational Health and Safety Act. The summaries were prepared in such a way that they did not compromise the confidentiality of the particular party or parties involved in the matter that led to the request for an opinion from a Branch within the Division to the Legal Branch.

Having distributed these summaries "available for the asking" to the apparent satisfaction of those requesting, the Ministry was faced with the task of appearing even-handed to employers. As I mentioned in my letter of May 4, Mr. Barnes raised the issue of distribution to employers at Council's March 8, 1983 meeting. We are now considering how this might best be done, and your advice on this aspect of the matter would be appreciated. One possibility would be to provide the material to Employer Safety Associations, in order that they may in turn inform their members, of the "on request" availability of summaries of legal interpretations under the Act.

I am not convinced however, that wholesale distribution of the legal interpretations, upon other than an "on request" basis, is warranted. The opinions in many instances deal with specific facts, and as a consequence cannot be applied to cases where the facts are dissimilar. Thus many of the opinions are not of general application. It is my view that mass distribution could lead to confusion and misapplication, and problems, instead of being solved could be compounded with argument whether a legal interpretation applied or did not apply in a given situation. Further, as experience increases, interpretations will have to be refined or even reconsidered. For these reasons, it is my view that mass distribution is not desirable because it could not only lead to confusion, but also have the effect of

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stultifying future interpretations and causing rigidity in what should be a developing and growing body of principles.

Subject to your further comments, I am prepared to advise the Safety Associations of the availability of the summaries and to continue to provide them to anyone upon request. I am of the view that the Act itself and the Guides to the Act, which contain interpretations suitable for a layman, are of greater value to the public than Ministry legal interpretations.

I am pleased to have received the observations of the Advisory Council on these matters, and look forward to a continuing dialogue as Council continues its deliberations on the subject of legal interpretations under the Act.

Yours sincerely,

R H Ramsay

R. H. Ramsay,
Minister.

Ontario

Advisory Council on
Occupational Health &
Occupational Safety

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Chairman

400 University Avenue
Toronto, Ontario
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416/965-2448

December 19, 1983

The Honourable R.H. Ramsay
Minister of Labour
400 University Avenue, 14th Floor
TORONTO, Ontario

Dear Mr. Ramsay:

This is further to your letter of May 18, 1983 in which you commented on council's Advisory Memorandum 82-VII concerning the legal interpretation of the Occupational Health and Safety Act.

Among the issues discussed in the memorandum was the right of workers to refuse to perform unsafe work, either because they feel that they are endangered by hazardous situations created by fellow workers, or because an individual worker believes that he might create a hazardous situation for himself or others because of his ill-health, incompetence, etc. It is my understanding that the minister is awaiting a ruling from the Attorney General on a question of legal interpretation, the answer to which will have a direct bearing on these issues. For this reason, council decided to reserve its response to your letter until it had had a chance to study this ruling and its implications. Since the Attorney General has taken much longer to respond than originally anticipated, however, council felt that an interim response to your comments on council's recommendation regarding the distribution of the guidelines was advisable.

In its Recommendation 82-13, the Advisory Council recommended that the ministry take steps to ensure that the legal guidelines, together with periodic updates, enjoy a wider distribution in the workplace. I understand that the guidelines are currently made available to the Ontario Federation of Labour, the Council of Safety Associations, the Royal Commission on Asbestos, the Directors of the Occupational Health and Safety Division, the Occupational Health and Safety Advisory Service, and to others upon request. Council feels that the scope of this distribution should be expanded to include the Ontario Federation of Labour affiliates and each of the individual safety associations.

Distribution to employer organizations should include the Canadian Manufacturers Association and the Ontario Chamber of Commerce. These two organizations could then inform their members of the availability of the guidelines via their inhouse publications.

In addition, council is of the opinion that it would be useful if a copy of the guidelines were made available in all district offices of the ministry to interested parties. Members of the ministry staff would therefore be available to assist with any problems that may arise regarding the applicability of the guidelines to specific circumstances. A notation in the ministry's edition of the Occupational Health and Safety Act, beneath the list of the district offices, could indicate that the guidelines are available on this basis.

Finally, you stated that, in your opinion, a wider distribution of the guidelines could lead to confusion and misapplication since the opinions in many instances deal with specific situations and cannot, therefore, be applied to cases where the facts are dissimilar. You also stress that the interpretations are only legal opinions as opposed to decisions of courts or tribunals which would bind the parties. Council appreciates your concern, but feels that a suitably worded introduction to the guidelines setting out these qualifications, together with an assurance that the ministry's Legal Branch would offer assistance in the case of doubt or confusion, would help to alleviate these difficulties.

As I have stated previously, this is an interim response to your comments on Advisory Memorandum 82-VII. Council will respond more fully when it has had a chance to study the ruling of the Attorney General.

Yours truly,

J. F. Mustard
Chairman

cc to: T. E. Armstrong, Q.C.
Dr. A. E. Robinson
Mr. Brian Goodman

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March 1, 1984

Dr. Dennis McCalla
Chairman
Advisory Council on Occupational
Health and Occupational Safety
15th Floor
400 University Avenue
Toronto, Ontario
M7A 1T7

Dear Dr. McCalla:

This is in response to Dr. Mustard's letter dated December 19, 1983, in which he commented on my response to Advisory Memorandum 82-VII concerning the legal interpretation of the Occupational Health and Safety Act. At the outset his letter raises the question of whether a worker has the right to refuse unsafe work where the worker believes that he or she may be endangered by hazardous conditions created by other employees. Council's advice on this subject has already been set out in the advisory memorandum, and you have received my response.

I understand that Council staff members were advised that the legal opinion referred to in Dr. Mustard's letter had been recently received from the Ministry of the Attorney-General. The Ministry's Legal Branch has reviewed the opinion, and is in the process of conducting further research in relation to the issue. As you may know, in making a decision on the appeal of an inspectors decision concerning the right of a worker to refuse work when exposed to second hand cigarette smoke, the Director was not required to address the issue of whether section 23 applied or not.

The second matter addressed in Dr. Mustard's letter relates to the manner in which legal opinions formulated by the Ministry of Labour should be distributed. I have reviewed Dr. Mustard's suggestions with my officials, and have concluded that the approach recommended is sound. In future therefore, the Ministry's compendium of legal opinions and periodic updates thereto will be disseminated according to scheme outlined.

There are, however, two additional points raised in Dr. Mustard's correspondence that merit further comment. First, Council has suggested that a suitably worded introduction, setting out both the nature and the restricted applicability of the legal opinions provided would minimize confusion in the minds of interested parties. I wish to point out that a statement to this effect already appears in the forward of each compendium. Second, Council has advanced the proposition that the

Ministry's Legal Services Branch should offer assistance, on a regular basis, to individuals who are confused about the applicability of a particular legal opinion. I have discussed this suggestion with my officials who have advised me that the assistance of Ministry legal staff at this stage of the process would be inappropriate. Where the parties in the workplace are unable to determine whether the Act or the regulations applies to a particular fact situation, the assistance of a Ministry inspector may be sought. Where, following the inspector's visit, there still exists genuine doubt about the applicability of a particular legislative provision, further guidance from the Legal Services Branch may be obtained through the line branch.

Thank you for the interim response to my letter.

Yours sincerely,

R.H. Ramsay
Minister

RHR/rdb

Other Correspondence

Ontario

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April 19, 1983

J. F. Mustard, M.D.,
Chairman
Advisory Council on Occupational Health
and Occupational Safety
15th Floor
400 University Avenue
Toronto, Ontario

Dear Dr. Mustard:

I was pleased to learn that planning is proceeding for Council's proposed study of the on-going operations of joint health and safety committees in Ontario. I understand that Council, through its Task Force on the Implementation of the Occupational Health and Safety Act, will administer the study, assisted by an advisory or technical committee, composed of individuals knowledgeable about joint health and safety committees.

I firmly believe that the Ministry has an important and meaningful contribution to make to the work of this committee, and should be represented on it. The Ministry has a number of individuals who possess first hand knowledge and considerable expertise about the work of these committees.

I would suggest that it would be a mistake for Council not to take advantage of Ministry expertise in this area. Indeed, since the Ministry has such an important on-going responsibility in this field, it would be unwise and perhaps even unfair to exclude Ministry personnel from participating on the advisory or technical committee. The Task Force and Council would not be compromised by the Ministry's participation, since both would remain free to draw their own conclusions.

Once you have had an opportunity to consider my suggestion, I would appreciate hearing from you.

Yours sincerely

R. H. Ramsay
Minister

Ontario

Advisory Council on
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Occupational Safety

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400 University Avenue
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416/965-2448

May 13, 1983

The Honourable R. H. Ramsay
Minister of Labour
400 University Avenue
14th Floor
Toronto, Ontario
M7A 1T7

Dear Mr. Minister:

Thank you for your letter of April 19, 1983 concerning the membership of the advisory committee to the proposed study on the functioning of joint health and safety committees in Ontario. Although the mandate of this committee has not yet been fully articulated, it will, broadly speaking, provide technical advice to the task force on the implementation of the *Occupational Health and Safety Act* on all practical aspects of the project.

Since the advisory council has the overall responsibility for the study, your suggestion that the ministry be represented on the advisory committee was put to council at its May 10, 1983 meeting. Members were unanimous in their agreement with your comment that the ministry could make an important and meaningful contribution to the project by offering its firsthand knowledge and expertise. They felt strongly, however, that it is important that council should continue to maintain its arms-length relationship with the ministry, particularly on such a sensitive issue, and for this reason decided that a ministry representative should not sit as a member of the committee.

A more useful proposal, in the opinion of council, would be for a ministry representative to provide liaison between the ministry and the committee. This could involve, *inter alia*, providing background material and information represented by the committee, arranging for ministry experts to address the committee and/or the task force and attending committee meetings at the invitation of the committee chairman. It would be most helpful if you could forward to me at your earliest convenience the name of the individual who will assume these liaison duties.

.../2

The advisory council appreciates your concern that the resulting study will be a well designed and credible one and is confident that the ministry will do everything it can to facilitate this end.

My thanks again for your suggestion.

Yours truly,

J. F. Mustard, M.D.
Chairman

cc T. E. Armstrong, Q.C.
Dr. A. E. Robinson
Mr. B. Goodman

Ontario

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400 University Avenue
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June 2, 1983

J. F. Mustard, M.D.
Chairman
Advisory Council on Occupational
Health and Occupational Safety
400 University Ave.
15th floor,
Toronto, Ontario.
M7A 1T7

Dear Dr. Mustard:

During the Ministry's estimates debates this past January, Mr. Martel raised a series of questions concerning non-unionized workplaces which I undertook to draw to the attention of the Advisory Council. These questions are enclosed.

Perhaps Council's Task Force on the Implementation of the Act has already considered these questions. If not, I would appreciate the Task Force's review of these issues and any additional advice as to how the Ministry can improve its services to non-unionized establishments.

I look forward to receiving Council's advice.

Yours sincerely,

R. H. Ramsay,
Minister.

Enc.

QUESTIONS

1. How many non-unionized plants have health and safety committees?

2. Were workers on these committees properly appointed?

3. Are there regular meetings being held by those health and safety committees?

4. Is there compliance with the Act in the non-unionized work places?

5. Are workers being educated as to the content of the Act and their rights under it?

6. Who is funding the training of the health and safety committees in non-unionized firms so they know what their rights are?

7. How are workers protected against reprisals?

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December 22, 1983.

Dr. J. Fraser Mustard,
Chairman,
Advisory Council on Occupational
Health and Occupational Safety,
400 University Avenue,
15th Floor,
Toronto, Ontario,
M7A 1T7.

Dear Dr. Mustard:

The Ministry of Labour is anxious to maintain momentum in our program for the control of toxic substances. One of the major concerns is the identification and allocation of priorities, recognizing that not all hazards can be addressed at the same time.

The Occupational Health and Safety Division, which is responsible for developing the control programs recognizes the advantages of consulting with interested groups. Rather than consulting on an ad hoc basis with numerous client groups or sectors, the Division believes that it would be desirable for the Advisory Council to perform the major consultative role in assessing the appropriate priorities for action by the Ministry.

I should appreciate it if you would place this matter before Council at its next meeting. I am anxious to receive your early advice as to the role which Council might be prepared to undertake.

Yours sincerely,

Russ

R. H. Ramsay,
Minister.

Ontario

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400 University Avenue
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416/965-2448

March 15, 1984

The Honourable R. H. Ramsay
Minister of Labour
400 University Avenue, 14th Floor
Toronto, Ontario

Dear Mr. Minister:

This is further to your letter of December 22, 1983 in which you suggested that the Advisory Council may wish to perform the major consultative role in assessing the appropriate priorities for action by the ministry in its program for the control of toxic substances.

Subsequent discussions between representatives of council and ministry officials resulted in a clarification of this request. It was indicated that, in the short term, council was being asked to assist the ministry in choosing the next group of substances to be subjected to more detailed study with an eye to possible designation of these substances.

Council members are of the opinion that formal participation in the process of designation would directly conflict with council's current role in reviewing the process leading to the development of designated substance regulations. Council feels, however, that the ministry should consult widely with individuals and other groups with an interest in this area.

The Advisory Council recognizes the need for a set of detailed criteria by which to assess priorities for the control of toxic substances in the workplace and feels that the development of such criteria is a task which council could usefully undertake at this time.

Yours sincerely,

D. R. McCalla
Chairman

cc to T. E. Armstrong, QC
Dr. A. E. Robinson
B. Goodman

Ontario

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April 25, 1984

Dr. D.R. McCalla
Chairman
Advisory Council of Occupational Health
and Occupational Safety
400 University Avenue
Toronto, Ontario
M7A 1T7

Dear Dr. McCalla:

Thank you for your letter of March 15, 1984 in which you advise of the Advisory Council's decision that formal participation in the process of designation would directly conflict with Council's current role in reviewing the process leading to the development of designated substance regulations. I understand the concerns of Council members and accept this decision with regret and with the thought that this may be a matter of further discussion at some future date.

I note the offer by Council members to develop criteria by which to assess priorities for the control of toxic substances. My officials advise that could prove to be helpful to the work of the Division and I welcome Council's further thoughts on this.

Thank you for your cooperation.

Yours sincerely,

R. H. Ramsay

R.H. Ramsay
Minister

Ontario

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400 University Avenue
Toronto, Ontario
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February 15, 1984

Dr. Dennis McCalla
Chairman
Advisory Council on Occupational Health
and Occupational Safety
400 University Avenue, 15th Floor
Toronto, Ontario
M7A 1T7

Dear Dr. McCalla:

As you know, on November 13, 1982, I published a Notice of Intention to designate eight substances, of which one was styrene. Styrene was considered for designation because of its widespread use, the large numbers of workers exposed to the substance in Ontario and because of its known toxic effects. A consultant's report on "Worker Exposure to Styrene" was one of the main sources of information used by the Ministry. A copy is enclosed.

Forty-five individuals and organizations subsequently submitted comments on the designation of styrene. Attached for your information are the "Compendium of Comments" and the "Summary of Comments" on the Notice of Intention to designate styrene. Thirty-one respondents represented industry, three spoke for trade associations and eight represented labour. Twelve respondents supported designation while twenty-eight respondents, principally those representing the reinforced plastics and composites industry (RP/C Industry), were opposed to the designation of styrene.

At the time the Notice of Intention was published my officials commissioned a detailed review of the health effects information. I have been advised by my officials that, based on existing evidence, it is reasonable to believe that the irritational and the neurobehavioural health effects of styrene are not of a long-lasting nature and that after removal from exposure there are no long-term health effects. The authors of a final draft health effects document prepared by Syracuse Research Corporation for the Ministry (attached), concluded that "the data at present are insufficient to classify styrene as either an animal or human carcinogen".

Based on the advice received from my officials concerning the health effects of styrene and after reviewing the attached "Summary Report of the Occupational Health and Safety Division Legislative Review Committee", I have decided to defer the formal process of designating styrene. Since this is the first time that such a step has been taken in our designated substances program, I wanted to advise the Council of my decision and reasons.

As mentioned earlier, my decision was influenced by the nature of the health effects of styrene. Furthermore, my information is that some 7400 workers in Ontario are exposed to styrene in the manufacture of styrene and styrene polymers, in the processing of styrene polymers and in the RP/C industry. I am advised that with the exception of the RP/C industry, worker exposure to styrene in Ontario is below 50 ppm (the current occupational exposure guideline) and in the case of processors of styrene polymers, below 1 ppm. The Ontario RP/C industry employs some 3000 workers in over 200 companies. The majority of these firms are very small (fewer than 10 employees) and are not unionized. Workers in the industry are often exposed to levels of styrene in excess of 50 ppm.

My officials and I have met with industry representatives to discuss ways and means of reducing styrene exposures. The Society of the Plastics Industry of Canada (SPI Canada) and the Allied Boating Association of Canada, the national trade associations for the RP/C industry have proposed as an alternative to designation, a voluntary styrene control program.

On September 27, 1983, SPI Canada and the Allied Boating Association of Canada held a management-labour seminar for the RP/C industry on the issue of styrene in the work place. Officials of the Occupational Health and Safety Division were invited and were among the speakers making presentations. The seminar was designed to explain in detail the proposed designation of styrene and to provide both labour and management in the industry with the elements necessary to develop their own control program.

I understand that at the completion of the seminar an RP/C Industry Committee was formed comprised of worker and management representatives from the fabricating shops and technical experts who can provide guidance regarding the toxicology, monitoring and control of styrene. Worker and management representatives serve as co-chairpersons. The Committee was asked to develop a work plan and a code of practice to assist RP/C fabricators to reduce worker exposure to styrene and to establish joint health and safety committees.

I am encouraged by the initiative taken by the RP/C industry, and have concluded that the industry should be given the opportunity to demonstrate that it is willing and able to reduce worker exposures. However, I believe that the deferral of the designation of styrene should be subject to the following conditions:

1. the RP/C industry will be expected to reduce styrene exposures to below a guideline exposure value to be approved by the Legislative Review Committee;

2. the Occupational Health and Safety Division will establish a committee to liaise with the RP/C industry committee to establish a timetable for compliance with the exposure guideline value, other than by persistent use of respiratory protection and to ensure that specific targets are met;

3. that appropriate respiratory protection be made available to and used by workers until exposure levels are reduced by means of engineering control and work practices; and

4. that the RP/C industry establish and maintain joint health and safety committees in all work places where workers are exposed to styrene.

My officials will continue to review the initiative concerning styrene. Should I be advised that new scientific evidence has become available linking exposure to styrene with more serious health effects or that the health of styrene exposed workers is not adequately protected under the proposed program, the process of designating styrene by regulation will be reinstituted by the publication of a proposed regulation.

I have advised the affected parties of my decision. My officials would be pleased to meet with Council to discuss this matter.

Yours sincerely,

R. H. Ramsay

R. H. Ramsay
Minister

Attachments (5)

THE PROPOSED REGULATION OF STYRENE AS A DESIGNATED SUBSTANCE

SUMMARY REPORT OF THE OCCUPATIONAL HEALTH AND SAFETY DIVISION'S LEGISLATIVE REVIEW COMMITTEE

Styrene is a colourless, volatile and flammable liquid used extensively in the manufacture of plastics and rubber and as a solvent for unsaturated polyester resins. Styrene is irritant, both as a liquid and as vapour, to the skin, eyes and respiratory tract and causes depression of the central nervous system.

On November 13, 1982, a Notice of Intent to designate styrene was published in The Ontario Gazette. Styrene was considered for designation because of its widespread use, the large numbers of workers exposed to it in the reinforced plastics/composites industry which includes fiberglass boat manufacturers, and because of its known toxic effects.

Based on the information available in the final draft of Health Effects Criteria Document for Styrene prepared by Syracuse Research Corporation for the Ministry of Labour, the following conclusion was made:

> **"Sufficient evidence is available from studies with human subjects and worker populations to establish that inhalation of styrene results in neurophysiologic impairment. Disturbances appear to be functional rather than morphological, affecting both associative and sensory processes. Dose-response relationships have been difficult to demonstrate, although it appears that the threshold exposure level for manifestation of early signs of neurobehavioural impairment is about 25 ppm as an 8-hour TWA concentration in air. More serious toxic effects such as liver dysfunction, respiratory irritation, frank neuropathies, and embryotoxicity may be expressed at higher doses".**

The conclusion concerning neurobehavioural impairment was reviewed by officials in Special Studies and Services who conclude that the effects of styrene are not perceived in general to be of a long-lasting nature and it is probable, based on existing evidence, that after removal from exposure there are no long-term health effects.

The authors of the Syracuse Research Corporation report considered the available animal studies and human epidemiological data to assess whether styrene might be considered to be a carcinogen. They concluded that "the data at present are insufficient to classify styrene as either an animal or human carcinogen".

Some 7,400 workers in Ontario are exposed to styrene. It is estimated that 1,000 workers are at risk of exposure during the manufacture of styrene and styrene polymers. The average concentrations of styrene in these industries range from 1 to 50 ppm as an 8-hour time-weighted average (TWA) and in most cases are well below 50 ppm as a TWA. About 3,400 workers are potentially exposed during the processing of styrene polymers and exposure levels are less than 50 ppm as a TWA and in most cases below 1 ppm as a TWA. About 3,000 workers are exposed in the reinforced plastics/composites industry to concentrations ranging from 20 to 300 ppm and occasionally higher. In the manufacture and processing of styrene, closed systems are used and the exposure of workers is well controlled. In the reinforced plastics/composites industry, open mould systems are used for the fabrication of large reinforced plastic products such as fiberglass boats and tanks. Workers in the reinforced plastics/composites industry are exposed to levels of styrene in excess of 50 ppm as a TWA.

The current Ontario occupational exposure guideline for styrene is 50 ppm, as a 40-hour TWA exposure and 100 ppm as a short-term exposure; these values are based on the American Conference of Governmental Industrial Hygienists Threshold Limit Value. The time-weighted average exposure limits for styrene presently in effect in various countries of the Western World range from 50 to 100 ppm with the exception of Sweden which has a guideline value of 25 ppm. It is understood that neither the United Kingdom nor the U.S. Occupational Safety and Health Administration intend to lower the exposure limit from 100 ppm (8-hour time-weighted average) in the near future. However, the U.S. National Institute for Occupational Safety and Health has completed a styrene criteria document, to be published shortly, containing a recommended time-weighted average exposure limit of 50 ppm.

For the period 1975-82 there were eighteen awards made by the Workers' Compensation Board relating to claims for the acute health effects of exposure to styrene; 6 were lost time awards, mostly as a result of styrene exposures in the reinforced plastics/composites industry.

Comments on the Notice of Intent to designate styrene, were submitted by forty-six individuals and organizations. Eight of these respondents represented labour organizations. Five of these supported designation because they stated styrene is a carcinogen; no supporting evidence was provided in their submissions. The carcinogenicity of styrene was not addressed in two briefs. One labour respondent, the Energy and Chemical Workers' Union, stated that "the evidence concerning the carcinogenicity of substances in the second notice regarding cadmium, styrene, chromium and ethylene oxide may in some cases be less compelling" but argued that this did not negate the need to designate styrene.

Twenty-eight respondents were opposed to the designation of styrene. The producers of styrene and styrene polymers and the processors of styrene polymers suggested that the potential for exposure in these groups is well below the exposure guideline of 50 ppm as a TWA.

Twenty-one briefs opposing the designation of styrene were received from respondents representing the reinforced plastics/composites industry. Most of these respondents endorsed the submission on the Notice of Intent from the Society of the Plastics Industry of Canada (SPI Canada), the national trade association for the plastics industry, which opposed designation of styrene and proposed as an alternative, a voluntary styrene control program.

As a first step in developing this program for the control of styrene emissions, the SPI Canada and the Allied Boating Association organized an industry-wide seminar for shop personnel and management on September 27, 1983. About 240 people (both employees and employers) representing 123 fabricators (who employ some 3,000 workers) attended the seminar. Occupational Health and Safety Division officials participated in the presentation.

At this seminar an Industry Committee was formed comprised of 4 worker and 6 management representatives from the fabricating shops, 2 representatives from the trade associations and 5 technical experts who could provide guidance regarding the toxicology, monitoring and control of styrene. It is intended that there be equal representation from both labour and management for the fabricators. The Chairpersons were selected so that a worker and a management representative will co-chair future meetings.

This Committee has instituted two industry surveys: (1) a survey to determine the nature of area and personal styrene monitoring, if any, within each shop to be completed by the end of November; and (2) a survey to determine the status and effectiveness of Joint Health and Safety Committees within the reinforced plastics/composites industry to be completed by the end of December.

The surveys will provide an initial data base for introduction of improved styrene monitoring and the development of individual programs to reduce the levels of styrene in each work place by means of engineering controls. The reinforced plastics/composites industry has indicated that a code of practice on the use of styrene will be prepared. The industry has proposed that all fabricators achieve compliance with a 100 ppm TWA exposure guideline within three years.

> **The Legislative Review Committee notes and supports these initiatives and recommends that the formal process of designation of styrene be held in abeyance pending assessment of the effectiveness of the industry-sponsored initiative to assess and control worker exposure but subject to the following:**
>
> **that Special Studies & Services will recommend a guideline exposure value for styrene based on consideration of health effects. Further advice and assistance may be sought from Syracuse Research Corporation or others with special and relevant knowledge.**
>
> **that a Division Committee be established, one or more members of which will liaise with the industry-based**

committee to establish a time table for compliance with the exposure guideline value, other than by the persistent use of protective respiratory equipment, and to ensure that the targets specified are met.

that pending compliance with the exposure guideline value, appropriate respiratory protection be made available to and be used by workers in order to protect their health. The industry-based committee should be asked to provide the necessary advice and instruction.

that the decision will be reviewed should new scientific evidence become available correlating exposure to styrene with more serious adverse health effects than were evident in the documents reviewed by the Syracuse Research Corporation in the preparation of their report.

The exposure value recommended by Special Studies and Services will be subject to the approval of the Legislative Review Committee as will be the workplan, including timetable, proposed by the industry-based committee. It is anticipated that the workplan will be agreed by the end of January, 1984. The Division Committee will monitor and audit the program initiated by the reinforced plastics/composites industry, under the auspices of the SPI, for the control of styrene and will report to the Legislative Review Committee at three month intervals.

Manufacturers of styrene and styrene polymers will be advised of the guideline exposure value so that the health of all workers exposed to styrene may be protected adequately.

If the Legislative Review Committee finds that the health of styrene-exposed workers is not adequately protected it may recommend that the process of developing a proposed regulation for styrene be restarted.

This report is based on a review of the literature on styrene; "Occupational Health Survey Worker Exposure to Styrene"; briefs in response to the Notice of Intent; meetings with affected parties; "Health Effects Criteria Document for Styrene"; exposure levels in other jurisdictions; the files of the Occupational Health and the Industrial Health and Safety Branches and the deliberations of the Occupational Health and Safety Division Legislative Review Committee.

Ontario

Advisory Council on
Occupational Health &
Occupational Safety

Office
of the
Chairman

400 University Avenue
Toronto, Ontario
M7A 1T7
416/965-2448

March 15, 1984

The Honourable R. H. Ramsay
Minister of Labour
400 University Avenue, 14th Floor
TORONTO, Ontario

Dear Mr. Ramsay:

Thank you for your letter of February 15, 1984, setting out the rationale for your decision to defer the formal process of designating styrene.

You noted that you have been advised that worker exposure to styrene in Ontario is below the current occupational exposure guideline, with the exception of the reinforced plastics and composites industry (RC/P Industry). Your letter indicated, however, that an RC/P Industry Committee has been formed comprised of worker and management representatives from the industry, together with technical experts, to develop a work plan and code of practice to assist RP/C fabricators to reduce worker exposure to styrene and to establish joint health and safety committees. You further pointed out that the deferral of the designation of styrene should be subject to a number of stipulated conditions.

Council will follow these developments with interest.

Yours sincerely,

D. R. McCalla
Chairman

Ontario

Office of the Minister

Ministry
of
Labour

400 University Avenue
Toronto, Ontario
M7A 1T7
(416) 965-4101

March 12, 1984

Dr. D. R. McCalla
Chairman
Advisory Council on Occupational Health
and Occupational Safety
400 University Avenue
15th floor
Toronto, Ontario
M7A 1T7

Dear Dr. McCalla:

As you know on November 13, 1982 I published a Notice of Intent to designate Benzene along with seven other substances. On July 30, I published a proposed regulation for Benzene in the Ontario Gazette. Following public comment, my officials presented a revised Benzene Regulation to interested parties at an open review meeting held on October 11, 1983. Since then my officials have been reviewing the comments that were made at that meeting and subsequently in briefs submitted to the Minister. As a result, I enclose a copy of the revised Benzene Regulation and my officials' "Report to the Advisory Council on the designation of Benzene in Ontario".

I look forward to receiving Council's comments on the consultative process followed by my officials in developing the proposed regulation and codes for Benzene.

Officials of the Occupational Health and Safety Division would be pleased to meet with Council members to discuss this matter at your earliest convenience.

Yours sincerely,

R. H. Ramsay
Minister

Encl.

Ontario

Office of the
Minister

Ministry
of
Labour

400 University Avenue
Toronto, Ontario
M7A 1T7
(416) 965-4101

April 18, 1984

Dr. D. R. McCalla
Chairman
Advisory Council on Occupational Health
and Occupational Safety
400 University Avenue, 15th Floor
Toronto, Ontario
M7A 1T7

Dear Dr. McCalla:

As you know on November 13, 1982 I published a Notice of Intention to designate Acrylonitrile along with seven other substances. On August 6, I published a proposed regulation for Acrylonitrile in The Ontario Gazette. Following public comment, my officials presented a revised Acrylonitrile Regulation to interested parties at an open review meeting held on October 18, 1983. Since then my officials have been reviewing the comments that were made at that meeting and subsequently in briefs submitted to the Minister. As a result, I enclose a copy of the revised Acrylonitrile Regulation and my officials' "Report to the Advisory Council on the Designation of Acrylonitrile in Ontario".

I look forward to receiving Council's comments on the consultative process followed by my officials in developing the proposed regulation and codes for Acrylonitrile.

Officials of the Occupational Health and Safety Division would be pleased to meet with Council members to discuss this matter at your earliest convenience.

Yours sincerely,

Russell H. Ramsay
Minister

Encl.

Ontario

Advisory Council on
Occupational Health &
Occupational Safety

Office
of the
Chairman

400 University Avenue
Toronto, Ontario
M7A 1T7

416/965-2448

May 8, 1984

The Honourable R. H. Ramsay
Minister of Labour
400 University Avenue, 14th Floor
TORONTO, Ontario
M7A 1T7

Dear Mr. Ramsay:

This will acknowledge receipt of your letter of April 18, 1984, forwarding the "Report to the Advisory Council on the Designation of Acrylonitrile in Ontario" and the proposed acrylonitrile regulation and codes for Council's review.

As you know, Council's Task Force on Principles and Procedures for Setting Standards and Regulations is presently reviewing the process followed in the development of the proposed benzene regulation. Consistent with past practice, Council will be proceeding to complete its review of the proposed benzene regulation before fully undertaking its review of the proposed regulation for acrylonitrile unless you advise to the contrary.

Yours truly,

D R McCalla

D. R. McCalla
Chairman

cc to: T. E. Armstrong, QC
Dr. A. E. Robinson
Mr. B. Goodman

Ontario

Office of the Minister

Ministry
of
Labour

400 University Avenue
Toronto, Ontario
M7A 1T7
(416) 965-4101

May 22, 1984

Dr. R. McCalla
Chairman
Advisory Council on
Occupational Health and
Occupational Safety
15th Floor
400 University Avenue
Toronto, Ontario
M7A 1T7

Dear Dr. McCalla:

Thank your for your letter of May 8, 1984 concerning the acrylonitrile regulation.

I appreciate that Council's Task Force is presently reviewing the process followed in the development of the proposed benzene regulation. In keeping with past practice of Council, I look forward to receiving your advice on acrylonitrile once your work on benzene has been completed.

Thank you for your continuing efforts to proceed in an expeditious manner with the review of these regulations.

Yours sincerely,

R. H. Ramsay
Minister

ADMINISTRATION

Legal Mandate of The Advisory Council

Section 10, the Occupational Health and Safety Act.

Advisory Council on Occupational Health and Occupational Safety

10.—(1) There shall be a council to be known as the Advisory Council on Occupational Health and Occupational Safety composed of not fewer than twelve and not more than twenty members appointed by the Lieutenant Governor in Council on the recommendation of the minister.

Term of office of members

2) The members of the advisory council shall be appointed for such term as the Lieutenant Governor in Council determines and shall be representative of management, labour and technical or professional persons and the public who are concerned with and have knowledge of occupational health and occupational safety.

Chairman and vice-chairman

3) The Lieutenant Governor in Council shall designate a chairman and a vice-chairman of the advisory council from among the members appointed.

Vacancies

4) The Lieutenant Governor in Council may fill any vacancy that occurs in the membership of the advisory council.

Remuneration and expenses

5) The remuneration and expenses of the members of the advisory council shall be determined by the Lieutenant Governor in Council and shall be paid out of the moneys appropriated therefor by the legislature.

Powers of advisory council

6) The advisory council, with the approval of the minister, may make rules and pass resolutions governing its procedure, including the calling of meetings, the establishment of a quorum, and the conduct of meetings.

Idem

7) The function of the advisory council is and it has power,

a) to make recommendations to the minister relating to programs of the ministry in occupational health and occupational safety; and

b) to advise the minister on matters relating to occupational health and occupational safety which may be brought to its attention or be referred to it.

Annual report

8) The advisory council shall file with the minister not later than the 1st day of June in each year an annual report upon the affairs of the advisory council.

Idem

9) The minister shall submit the report to the Lieutenant Governor in Council who shall cause the report to be laid before the assembly if it is in session or, if not, at the next ensuing session. 1978, c. 83, s. 10.

Primary objective of advisory council

To advise the Minister of Labour on all matters relative to occupational health and safety in Ontario.

Secondary objectives of advisory council

1. To ensure as far as is possible that the policies and programs in occupational health and safety effectively minimize the risks to health and safety in all workplaces in Ontario.
2. To ensure as far as is possible that knowledge about occupational health and safety is available to management, labour and the public and that it is understood by them.
3. To assist in promoting and establishing mechanisms involving management and labour to solve problems in occupational health and safety.
4. To ensure as far as is possible that there is appropriate manpower training and development for the occupational health and safety field.

5* To review periodically the effectiveness of the policies and programs implemented to achieve secondary objectives 1 to 4.

Terms of reference of advisory council

1. To make recommendations on matters referred to it by the minister, submitted to it by interested parties or pursued by the council on its own initiative.
2. To advise the minister on programs in the field of occupational health and safety.
3. To advise the minister on policies, principles and procedures used in standard setting and in the development of guidelines to be used by the government.
4. To review and make recommendations to the minister on the introduction of new substances such as chemicals into the workplace.
5. To review and make recommendations on the detection, measurement and control of occupational health and safety hazards in the workplace.
6. To review and make recommendations about the arrangements for occupational health and safety for groups and areas where there are no formal health and safety programs or the programs are judged to be inadequate.
7. To advise the minister on priorities for research and development in occupational health and safety.
8. To advise the minister on priorities for manpower training and development in the field of occupational health and safety.
9. To prepare an annual report to the minister, which shall include the advisory memoranda, recommendations of the council and the government response.

*added June 1980

Meetings of The Advisory Council

April 5, 1983
May 10, 1983
June 27, 1983*
August 9, 1983
September 13, 1983
October 11, 1983
December 13, 1983*
January 10, 1984
February 14, 1984
March 13, 1984

Special Meetings of Council

August 22, 1983–To review proposed regulation on Silica.

*Discussions with ministry staff followed by dinner with minister.

TASK FORCES

TASK FORCES OF ADVISORY COUNCIL ON OCCUPATIONAL HEALTH AND OCCUPATIONAL SAFETY

TASK FORCE ON PRINCIPLES AND PROCEDURES FOR SETTING STANDARDS AND REGULATIONS

Terms of Reference
To establish guidelines by which council can determine the appropriateness of the principles, policies and procedures used in setting the standards and regulations in occupational health and safety in Ontario.
To include such things as the development of the regulations and public input about those regulations.

Members

Council Members
L. Heard — Chairman
J. W. Charters — (from December 1983)
W.K.C. Morgan — (from December 1983)
J. M. More

Special Advisors for Regulations on

Isocyanates	*Silica*
R. T. Boldt	W.K.C. Morgan
E. Kaegi	D.F.C. Muir — McMaster University
D. R. McCalla	M.A. Taschereau
Meetings Held	
April 4, 1983*	June 17, 1983
April 11, 1983*	August 8, 1983
May 6, 1983*	January 30, 1984
Reports to Council	
May 10, 1983	August 22, 1983
Resulting in	
Advisory Memorandum	Advisory Memorandum
83-I	83-II
May 31, 1983	September 7, 1983

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*telephone conference

TASK FORCE ON THE ROLE OF HEALTH SURVEILLANCE AND HEALTH SCREENING IN OCCUPATIONAL HEALTH PROGRAMS

Terms of Reference

i) To identify the risks, benefits and costs of health surveillance and health screening in occupational health programs.

ii) To review the laws and procedures governing health surveillance and health screening with regard to the rights and duties of employers, employees, government and the professions.

iii) To make recommendations to the council on policies and principles governing health surveillance and health screening in occupational health programs.

Members

Council Members
J. F. Mustard — Chairman (to January 31, 1984)
J. W. Charters
J. M. More
H. D. Moyer — (from December 13, 1983)
T. O'Connor — (from December 13, 1983)

Others
T. Ison — Osgoode Hall Law School
J. Robertson — Canadian Airline Employees' Association
D. Sackett — McMaster University

Meetings Held	*Reports to Council*	*Resulting in*
May 13, 1983	June 27, 1983	Advisory Memorandum
	August 9, 1983	83-III
	September 13, 1983	December 16, 1983

TASK FORCE ON LITERACY AND OCCUPATIONAL HEALTH AND SAFETY

Terms of Reference

i) To examine the extent of the problem of illiteracy in the workforce.

ii) To identify the effects of illiteracy on the effectiveness of occupational health and safety.

iii) To propose recommendations on how proplems associated with illiteracy and occupational health and safety can be resolved in the short term and the long term.

Members

Council Members
W. A. Barnes*
P. A. Fisher
E. A. Waddell

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*Term as member of council expired October 31, 1983.

Others

James Draper — OISE — Chairman
R. J. Adams — McMaster University
J. Pearpoint — Frontier College

Liaison Representatives

D. Maudsley — Ministry of Education
S. Pratt — Ministry of Citizenship and Culture

Meetings Held	*Reports to Council*
April 4, 1983	October 11, 1983
May 26, 1983	December 13, 1983
December 6, 1983	

TASK FORCE ON WOMEN AND OCCUPATIONAL HEALTH AND SAFETY

Terms of Reference

i) To review the occupational health and safety problems of women at work.
ii) To examine the issue of susceptibility.
iii) To examine whether existing occupational health and safety standards and procedures take into account special needs, if any, of women.
iv) To propose recommendations to the council on any matters identified in the study.

Members

Council Members

G. J. Stopps* — Chairman (to October 31, 1983)
N. Caldbick
J. M. More

Others

S. Bobier — Ortho Pharmaceutical (Canada) Ltd.
R. DeMatteo — Ontario Public Service Employees' Union

Reports to Council

April 5, 1983
May 10, 1983
September 13, 1983
October 11, 1983
February 14, 1984

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*Term as member of council expired October 31, 1983.

TASK FORCE ON THE POSSIBLE HEALTH HAZARDS OF VISUAL DISPLAY UNITS (VDUs)

Terms of Reference

To evaluate the available information on the possible hazards to human health associated with the use of visual display units.

The term health to include discomfort, degradation of visual acuity and excessive fatigue as well as better-defined disease states, such as cataracts.

Members

Council Members

G. J. Stopps* — (as Chairman to October 31, 1983)
E. Kaegi

Others

R. DeMatteo — Ontario Public Service Employees' Union
J. Keene-Moore — Bell Northern Research
R. C. Frecker — University of Toronto (from April 27, 1983)
J. Parker — University of Toronto (to April 26, 1983)
J. Purdham — Canadian Centre for Occupational Health and Safety
R. Roberts — McMaster University
S. Stuchly — University of Ottawa
L. Torney — Southern Ontario Newspaper Guild
S. Garnett — McMaster University

Meetings Held	*Reports to Council*
May 6, 1983	August 9, 1983
May 31, 1983	December 13, 1983

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*Term as member of council expired October 31, 1983.

TASK FORCE ON THE IMPLEMENTATION OF THE OCCUPATIONAL HEALTH AND SAFETY ACT

Terms of Reference

i) To review the application and interpretation of the Act and regulations, with particular reference to such issues as:
   - — the right to refuse work
   - — the role of government
   - — legal interpretations
   - — responsibilities regarding health and safety information.

ii) To examine the functioning of the joint health and safety committees, including the matter of access to information.

iii) To review the application and implementation of the designated substances regulations.

iv) To make appropriate recommendations.

Members

Council Members
J. F. Mustard — Chairman (to May 23, 1983)
C. J. Tuohy — Chairman (from May 24, 1983)
W. A. Barnes*
R. T. Boldt
J. Duffy
P. A. Fisher**
J. Gill***
E. Kaegi***
M. A. Taschereau*
E. A. Waddell**

Others
K. Glassco — Energy & Chemical Workers Union (Polysar Ltd.)
J. N. Lockington** *** — Dofasco
T. H. Meagher — OFL
C. Schmidt — United Rubber Workers of America (Uniroyal Ltd.)
K. Swinton*** — University of Toronto, Faculty of Law

Technical Advisory Committee
(for survey of joint health and safety committees)

Members
K. Swinton — Chairman (from November 1983)
K. Glassco
L. Jolley — Consultant
G. Little — Dow Chemical
J. Miller — Kidd Creek Mines

Meetings Held

Task Force Meetings Held

April 18, 1983
May 24, 1983
August 3, 1983
November 16, 1983
January 27, 1984

Subcommittee Meetings Held
Role of Government

April 18, 1983
January 4, 1984

Reports to Council
Legal Interpretations

December 13, 1983
January 4, 1984

Resulting in
Letter to the Minister
December 19, 1983

Technical Advisory Committee

June 29, 1983
August 3, 1983
November 4, 1983
November 30, 1983
December 16, 1983
January 24, 1984

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*Term as member of council expired October 31, 1983.
**Member of subcommittee on Role of Government
***Member of subcommittee on Legal Interpretations.

TASK FORCE ON THE INTERPRETATION OF HEALTH EFFECTS DATA AND THE ROLE OF ECONOMIC ANALYSIS IN THE STANDARD-SETTING PROCESS

Terms of Reference

i) a) To examine the principles and procedures which should be employed to [i] evaluate health effects data and [ii] classify and rank health effects studies.

b) To examine [i] the appropriate role for economic analysis in the standard-setting process and [ii] the kinds of economic information (if any) which should be collected and analysed as part of the process for developing regulations.

c) To determine whether common principles can be applied to the interpretation and analysis of health effects and economic cost data.

ii) To examine the manner in which health effects and economic information should be integrated in the regulation of hazardous substances.

iii) To make recommendations to council in respect to these issues.

Members

Council Members
L. Heard
C. J. Tuohy

Others
R. D. Fraser — Chairman — Queen's University
G. Atherley (alternate J. Purdham) — Canadian Centre for Occupational Health and Safety
E. Farber — Banting Institute
A. L. Gladstone — Ministry of Labour (ex-officio)
L. Jolley — Consultant
R. Roberts — McMaster University

TASK FORCE ON CARCINOGENS

Terms of Reference

i) To examine the principles governing the regulation development process to determine how the process can effectively and efficiently identify, prioritize and regulate carcinogens.

ii) To propose recommendations of the policies and principles governing the development of regulations for carcinogens.

Members

Council Members
J. F. Mustard — Chairman (to January 31, 1984)
D. R. McCalla — (Chairman from February 1, 1984)
R. T. Boldt — (from February 8, 1983)
E. A. Waddell — (from February 8, 1983)

Others
E. Farber — Banting Institute
A. B. Miller — University of Toronto
J. E. Till — Ontario Cancer Institute

Meetings Held	*Reports to Council*	*Resulting in*
May 27, 1983	December 13, 1983	Advisory Memorandum 83-IV March 23, 1984
September 19, 1983	January 10, 1984	
November 8, 1983	February 14, 1984	
December 1, 1983		

SCIENTIFIC TASK FORCE ON TALC

Terms of Reference

To assess the following:

(1) Is there adequate evidence to correlate exposure of 'fibres', derived from silicates of the asbestos group that occur in the form of cleavage fragments, with adverse effects on health?

(2) Do the known, suspected or predicted effects on health of exposure to such fibres warrant control under the Asbestos Regulation or should a 'mineral fibre' regulation be developed?

Members
Dr. H. A. Anderson — State of Wisconsin, Madison, Wisconsin
Dr. J. Kramer — McMaster University, Hamilton
Dr. D.C.F. Muir, (Chairman) — McMaster University, Hamilton
Dr. P. Sebastien — McGill University, Montreal

Meetings Held
August 4, 1983
October 27, 1983
March 19, 1984

APPENDICES

APPENDIX A

Injuries, Permanent Disabilities and Fatalities Receiving First Payment of Compensation in 1982 by Year-End 1983, Classified by Nature of Injury

Nature of injury	*Major Permanent Disabilities*		*Other Disabling Injuries*		*Fatalities*	
	No.	*%*	*No.*	*%*	*No.*	*%*
Amputation or enucleation	9	1.65	717	0.48	1	0.50
Asphyxia, strangulation or drowning	0	0.00	0	0.00	7	3.48
Burn, scald-heat	0	0.00	3,490	2.36	4	1.99
Concussion, brain-cerebral	1	0.18	345	0.23	0	0.00
Contusion, crushing, bruise-intact skin	37	6.79	15,705	10.61	109	54.23
Cut, laceration, punctere-open wound	8	1.47	17,260	11.66	1	0.50
Dislocation	1	0.18	583	0.36	0	0.00
Electric shock, electrocution	0	0.00	166	0.11	8	3.98
Fracture	15	2.75	7,414	5.01	2	1.00
Hernia, rupture	4	0.73	1,726	1.17	0	0.00
Scratch, abrasion-superficial wound	0	0.00	4,657	3.15	0	0.00
Sprain, strain	236	43.30	43,739	29.56	1	0.50
Multiple injuries	13	2.39	930	0.63	5	2.49
Occupational injuries, unspecified	173	31.75	45,080	30.47	4	1.99
Occupational injuries, NEC	3	0.55	64	0.04	3	1.49
Burn-chemical	1	0.18	998	0.67	0	0.00
Tuberculosis only	0	0.00	5	0.00	0	0.00
Tuberculosis and pneumoconiosis	0	0.00	0	0.00	0	0.00
Contagious and infectious diseases, NEC	1	0.18	333	0.23	1	0.50
Dermatitis	19	3.49	637	0.43	0	0.00
Freezing, frost-bite — environmental cold	3	0.55	64	0.04	0	0.00
Hearing loss or impairment	0	0.00	1,332	0.90	0	0.00
Heat — sunstroke — environmental heat	1	0.18	12	0.01	0	0.00
Bursitis	2	0.37	30	0.02	0	0.00
Synovitis, tenosynovitis	7	1.28	528	0.36	0	0.00
Inflammation, irritation, NEC	1	0.18	371	0.25	0	0.00
Poisoning, systemic	1	0.18	675	0.46	3	1.49
Silicosis	1	0.18	29	0.02	0	0.00
Asbestosis	2	0.37	10	0.01	0	0.00
Pneumoconiosis, NEC	1	0.18	58	0.04	0	0.00
Radiation effects	0	0.00	775	0.52	0	0.00
Caisson's disease	0	0.00	5	0.00	0	0.00
Occupational illness, NEC	5	0.92	222	0.15	52	25.87
Non-personal damage	0	0.00	51	0.03	0	0.00
Other — preventive measures	0	0.00	1	0.00	0	0.00
Total	545	99.97	147,976	99.98	201	100.01

Source: Canadian Centre for Occupational Health and Safety, May 1984

APPENDIX B

Fatality Frequency Rates per Million Man-hours and Numbers of Fatalities for Major Industries in Ontario in 1982

Industry[2]	*Number of Fatalities*[1] *Attributed to:* *Occupational Disease*	*Trauma*	*Fatalities per Million Man-Hours*
Agriculture	2	7	0.13
Forestry	1	5	0.34
Mines, Quarries & Oilwells	20	10	0.48
Manufacturing	19	38	0.03
Construction	7	26	0.15
Transportation, Communication and Utilities	2	17	0.15
Trade	1	6	0.01
Community, Business and Personal Services	0	12	0.01
Public Administration	1	0	0.01
Other	0	1	0.78
All (Schedule 1 only)	53	122	0.04
All (Schedule 2 included)	56	145	

[1] Fatalities are those who received their first payment of compensation in 1982 and were dead by the end of 1983. These figures are different from those in the Workers' Compensation Board's record of fatalities.

[2] The WCB rate groups have been allocated to the Statistics Canada's Major Economic Divisons.

Source: Canadian Centre for Occupational Health and Safety, May 1984.

APPENDIX C
Compensated Work Injury Frequency Rate per Million Man-hours in Ontario 1981-1982

Industry[1]	*1981*	*1982*[2]
Agriculture	36.08	33.04
Forestry and Logging	83.82	65.20
Mining, Quarries and Oilwells	56.09	47.27
Manufacturing	36.88	30.23
Construction	68.68	53.33
Transportation and Communication	62.05	58.24
Trade, Wholesale and Retail	18.15	15.69
Services		
Hospital	22.76	19.95
Teaching	10.67	10.19
All	11.91	11.06
Public Administration	31.17	29.57
Others (Fishing)	28.16	29.59
All Industries (Schedule 1)	29.37	24.53

1. The WBC groups have been allocated to the Statistics Canada's Major Economic Divisons.

2. Provisional

Source: Canadian Centre for Occupational Health and Safety, May 1984; from Workers' Compensation Board's Accident Frequency and Cost Rate Reports.

APPENDIX C-1
Number of Compensated Work Injuries 1981-1982

Industry[1]	*1981*	*1982*[2]
Agriculture	2,703	2,361
Forestry and Logging	1,663	1,162
Mining, Quarries and Oilwells	4,046	2,940
Manufacturing	73,924	59,516
Construction	14,562	11,536
Transportation and Communication	8,403	7,576
Trade, Wholesale and Retail	14,452	12,921
Services		
Hospital	7,334	7,103
Teaching	1,156	1,205
All	12,526	11,814
Public Administration	2,335	2,396
Others (Fishing)	35	38
All Industries (Schedule 1)	143,139	120,568

1. The WBC rate groups have been allocated to the Statistics Canada's Major Economic Divisons.

2. Provisional.

Source: Canadian Centre for Occupational Health and Safety, May 1984; from Workers' Compensation Board's Accident Frequency and Cost Rate Reports.

APPENDIX D

Injuries Receiving Compensation in 1982 by Occupation and Frequency per 100 Workers Covered by the Workers' Compensation Board of Ontario

Occupation[1]	*Disabling Injuries 1982*[2]	*Estimated Employment Covered by WCB (000)*[3]	*Estimated Injuries per 100 Workers Covered by WCB*
Managerial, Professional	726	353	0.21
Natural Science	1,156	160	0.72
Social Science	713	70	1.02
Religion	3	9	0.03
Teaching	1,055	146	0.72
Medicine and Health	5,696	172	3.31
Artistic and Recreational	375	65	0.58
Clerical	9,231	703	1.31
Sales	4,097	413	0.99
Service	17,468	474	3.69
Agriculture	2,641	88	3.00
Fishing, Hunting, Trapping	29	1	2.90
Forestry and Logging	1,111	9	12.34
Mining and Quarrying	1,884	12	15.70
Processing	10,199	132	7.73
Machining	13,030	107	12.18
Product Fabricating	21,730	390	5.57
Construction Trades	14,130	185	7.64
Transport Equipment Operation	11,462	127	9.03
Material Handling	8,679	99	8.77
Other Craft and Equipment Operation	1,725	53	3.25
Not Stated	9,526	—	—
Occupation, NEC	12,047	—	—
Total	148,713	3,768	

1. Taken from the *Canadian Classification and Directory of Occupations.*

2. Receiving first payment of compensation from the Workers' Compensation Board in Ontario in 1982 Data from Schedules 1 and 2.

3. Derived from Statistics Canada Labour Force Survey, 1982. It is estimated that Ontario WCB covers approximately 92.5% of the employed labour force.

Source: Canadian Centre for Occupational Health and Safety, May 1984.

APPENDIX D-1

Selected Occupations Defined by Subgroup from the Canadian Classification and Dictionary of Occupations

1. *Mining* and quarrying including oil and gas field operations have the following occupational groups included: foremen, rotary well-drilling, other rock and soil drilling, blasting, cutting, handling and loading, labouring and other elemental work, and not elswhere classified (NEC).

2. *Machining* and related occupations have these groups included: foremen *metal machining*: tool and die making, machinist and machine tool setup, machine tool operating; *metal shaping and forming*: forging, sheet metal workers; welding and flame cutting, boilermakers, platers and structural metal workers; foremen *wood machining*: wood pattern making, wood sawing and related work, wood sanding; foremen *clay, glass and stone and related materials*: cutting and shaping, abrading and polishing; foremen *other machining* and related work, engravers and etchers, filing, grinding, buffing, cleaning and polishing work, inspecting, testing, grading and sampling occupations.

3. *Forestry* includes these groups of occupations: foremen forestry and logging, forestry conservation, timber cutting, log hoisting, sorting, moving, labouring, forestry and logging NEC, log inspecting, grading and scaling.

4. *Materials handling* has these occupations grouped together: foremen materials handling NEC, hoisting operations NEC, longshoremen, stevedores and freight handlers, materials handling equipment operators NEC, packaging, labouring in materials handling work.

5. *Processing* occupations are composed of: *mineral ore*: treating, crushing and grinding, mixing, filtering, melting and roasting; *metal processing*: smelting, converting and refining, metal heat treating, metal rolling, moulding, coremaking and metal casting, metal extruding and drawing, plating and metal spraying: *clay, glass and stone* furnacemen and kilnmen, separating, grinding, crushing and mixing, forming; *chemicals, petroleum, rubber, plastic and related materials:* mixing and blending, filtering, straining and separating, distilling, subliming and carbonizing, coating and calendarizing; *food, beverage and related*: flour and grain milling, baking, confectionery making, slaughtering and meat cutting, canning, curing and packing, fish canning, curing and packing, fruit and vegetable canning, preserving and packing, milk processing, sugar processing, beverage processing; *Wood*: sawmill sawyers, plywood making, wood treating; *Pulp and paper making*: cellulose preparing, papermaking and finishing; *Textiles*: fibre preparing, spinning, winding, weaving, knitting, bleaching, finishing; *Other*: tobacco, hide and pelt. Foremen, inspecting, testing and grading, elemental labour in all above groups.

6. *Transportation and Equipment* operating occupations have the following sub-groups: air transport, railway transport, water transport, motor transport and the specific occupations in each.

7. *Construction* has these sub-groups: excavating, grading and paving, electrical power, lighting and wire communications equipment erecting, installing and repairing and construction trades—carpenters, brick and stone masons, concrete finishing, plasterers, painters and paper hangers, insulating, roofing, pipe-fitting, structural metal erectors, glazers. Foremen inspecting, testing, grading and sampling, and elemental labour are included in the above where appropriate.

8. *Product fabricating* classification is composed of: metal products; electrical, electronic and related equipment; wood products; textile, fur and leather products; rubber, plastic and related products; mechanics and repairmen except electrical; and other: jewellery and silverware, marine craft, paper products, and painting and decorating.

APPENDIX E

Temporary Total Days Lost for Major Industries in Ontario 1977-1982[1]

	Year					
	1977	*1978*	*1979*	*1980*	*1981*	*1982*
Industry	*(000)*	*(000)*	*(000)*	*(000)*	*(000)*	*(000)*
Agriculture	91.2	90.8	100.3	112.0	116.4	119.2
Forestry	80.3	87.7	100.2	103.9	115.8	128.4
Mines, Quarries and Oilwells	232.6	246.1	197.6	212.9	241.7	325.8
Manufacturing	2,060.7	2,004.4	2,203.7	2,414.7	2,566.2	2,786.9
Construction	872.5	809.5	796.2	839.6	883.2	1,018.2
Transportation and Communication	256.6	237.7	260.4	285.3	319.9	375.5
Trade	340.1	331.9	362.3	393.3	415.8	459.4
Services	469.7	465.0	520.6	602.6	672.6	712.9
Public Administration	70.8	72.6	73.1	77.7	74.5	77.6
Other	0.8	0.7	1.1	0.5	0.7	1.1
All Industries (Schedule 1)	4,475.3	4,346.4	4,615.5	5,042.5	5,406.8	6,005.0

1. Shows days lost for temporary total disability by industry. Days lost for fatalities (permanent total) and for medical-aid only and light duty (temporary partial) are not included in these figures.

Source: Canadian Centre for Occupational Health and Safety — April 1983 from WCB's Bill 70 reports. The WCB rate number groups have been allocated to the industry categories by the Centre in compiling the data.